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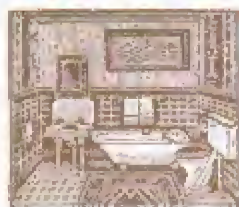
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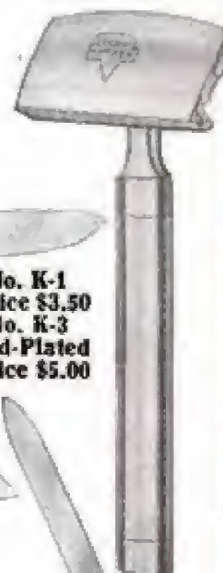
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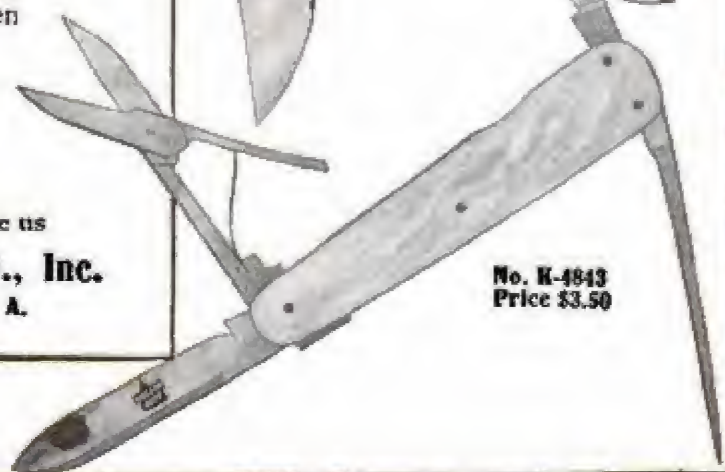
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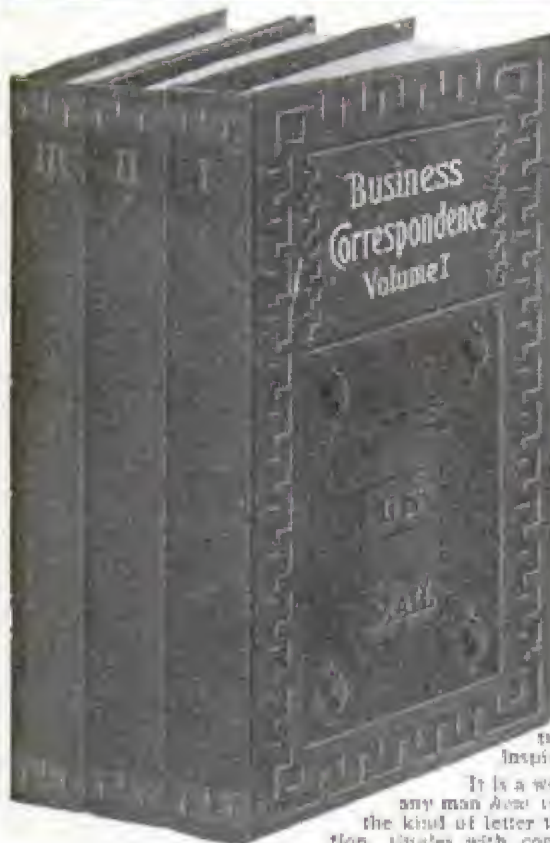
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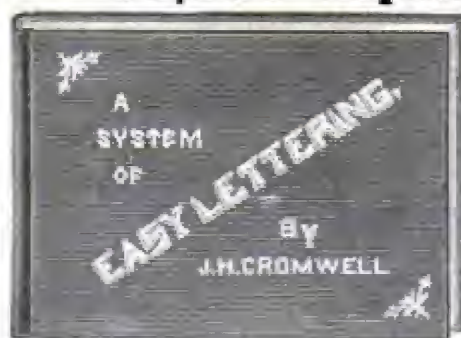
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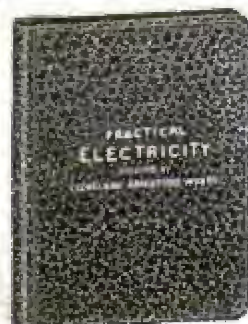
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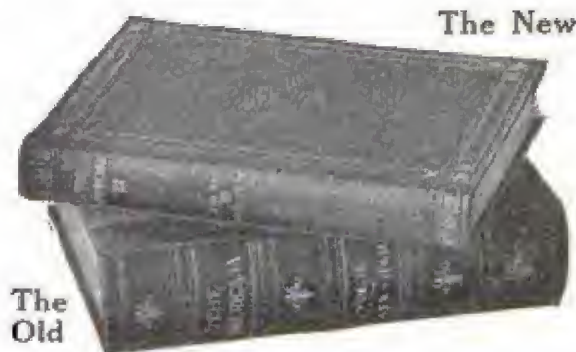
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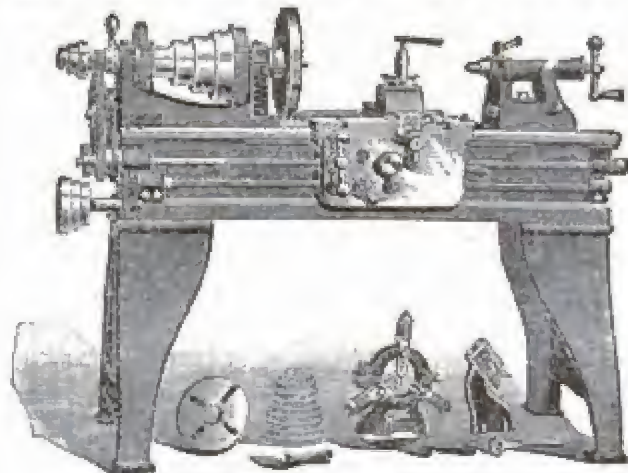
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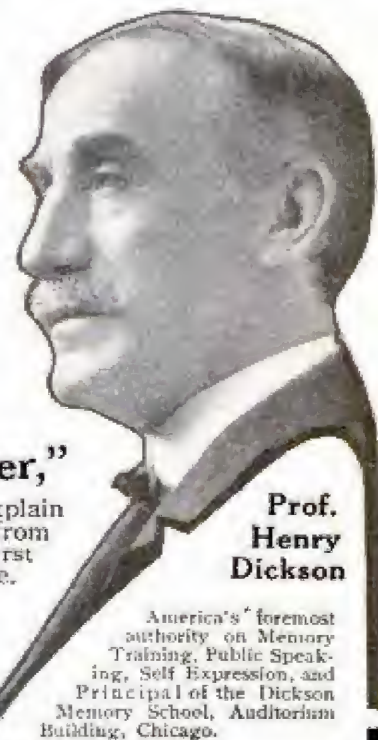
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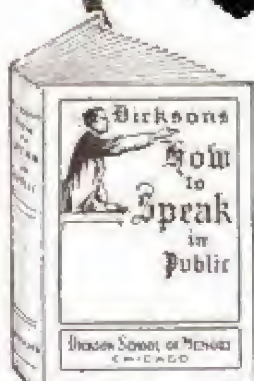
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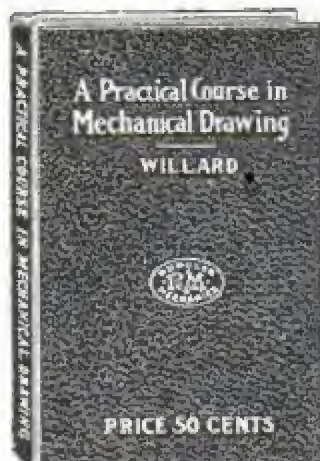
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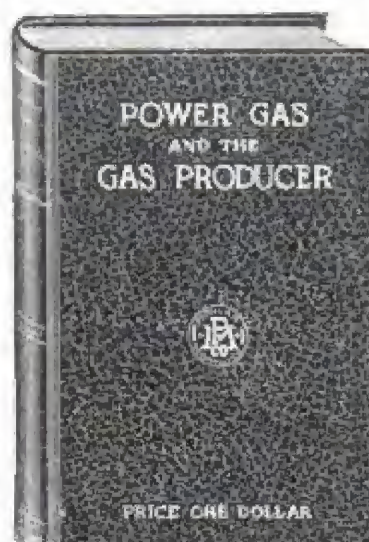
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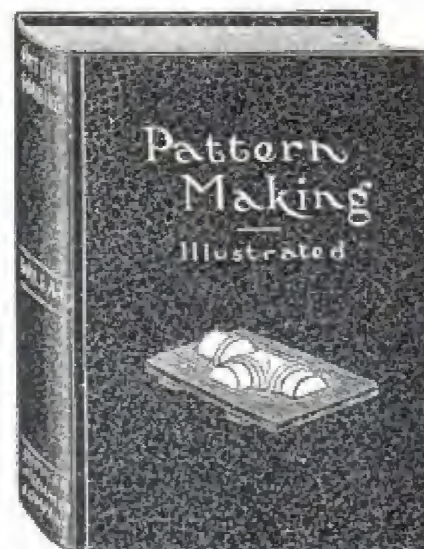
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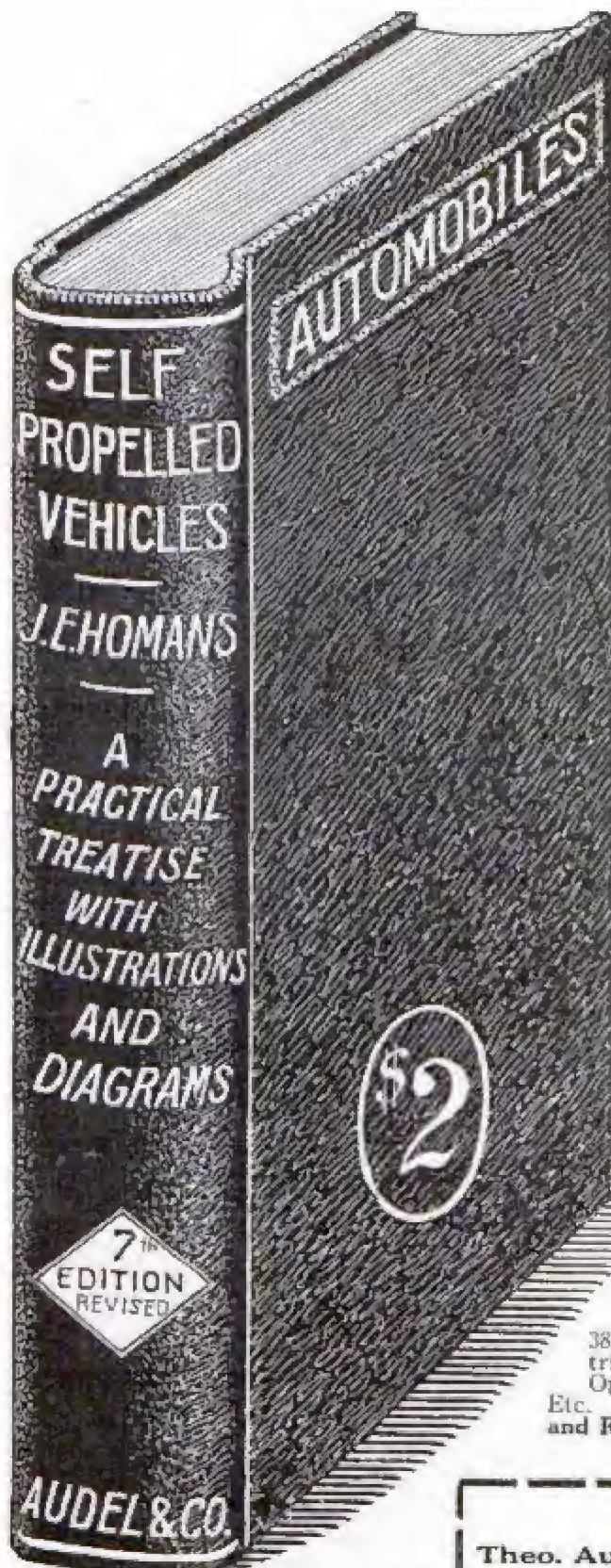
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AGENTS MAKE \$30.00 WEEKLY selling our 500 Handy Household Articles; catalogue free. Scheff Company, 1637 Wells Street, Chicago.

AGENTS WANTED—Send 15 cents for smallest Bible in the world and one of each of our catalogues, with agents' prices. A. S. Mankin & Co., Alexandria, Va.

AGENTS—PORTRAITS 35c, FRAMES 15c, Sheet Pictures 1c, Stereoscopes 25c, Views 1c, 30 Days' Credit. Samples and catalogue free. Consolidated Portrait, Dept. 1137, 1027 W. Adams St., Chicago.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 306, Boston, Mass.

AGENTS' specialties that sell. Big profits. No chance proposition. Success absolutely certain. Circulars furnished. Three samples for dime. Free particulars. Poolson Company, 213 East Tenth Street, N. Y.

OPPORTUNITY TO ESTABLISH PROFITABLE AGENCY. Representatives wanted for moderate priced office specialty of great merit; extensively advertised. Exclusive territory and assistance in making sales. Scofield Company, Manufacturers, 1950-1955 American Tract Society Building, New York.

WE PAY YOU WELL—Whole or part time to sell the Pratt Automatic Blind Latch. New. Demand everywhere. Showing sells it. Chance to make good money. Write today for particulars. Send 25c for sample. Lamford Sales, 203 Broadway, New York.

FREE GOLD SAMPLE goes with first letter. Something entirely new. Every firm wants it. Orders \$1.00 to \$100.00. Nice pleasant business. Write today. Metallic Sales Co., 460 N. Clark, Chicago.

AGENTS WANTED EVERYWHERE to sell our New Automatic Shaver. Puts a perfect edge on any razor, safety or old style. Quick sales; large profits. See our display ad on page 152 this issue. S. C. Kanner, 556 Broadway, New York.

HANDY TOOL HOLDERS save labor, time, money. Mechanics delighted. Fastest selling household device ever invented. Nickel plated pocket outfit, 5c. Big profits. Manager, 158 Lawrence St., Brooklyn, N. Y.

AGENTS—HANDKERCHIEFS, DRESS GOODS. Carleton made \$8.00 one afternoon; Mrs. Bosworth \$25.00 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 59 Main St., Brooklyn, N. Y.

\$5 TO \$10 A DAY for reliable men and women agents; easiest, fastest, best sellers, ever offered; nine sales to each ten calls, by our special plan; big profits for you. Full details free. Address Household Co., Agency Division, No. 63, Topeka, Kansas.

"TOUR AMERICAN CONTINENT," "Trip Around World," 50 water color post cards in attractive boxes. Both sets 25c. Big profits. Secor Company, 502 West 122d Street, New York.

MANUFACTURER WANTS AGENTS to sell Aurora Black Beauty Kitchen Set. Splendid opportunity. Handsome premium every customer. Aurora Mfg. Co., 335 Broadway, N. Y.

IF YOU ARE TIRED of working for other people; if your income is too small, or if you are looking for something to do during your spare time, write me for my big money making propositions. It will put you right. C. Palmer, Box 155, Weyburn, Sask, Canada.

SMALLEST ALARM CLOCK, blade and telescope, 10c each prepaid. W. H. Garner, A-119 South Lafayette St., Evansville, Indiana.

AGENTS HAVE STEADY INCOME selling our Novelty Changeable Signs, gold and silver letters; in demand everywhere; catalogue; Climax Novelty Co., 452 Gay Bldg., St. Louis.

AGENTS WANTED in every county to sell Transparent Handle Pocket Knives. Big commission paid. From \$75.00 to \$300.00 a month can be made. Write quick for terms. Novelty Cutlery Co., 57 Bar St., Canton, Ohio.

WANTED—DISTRIBUTING AGENTS—Each county, for Paroxo, the peroxide of Hydrogen washing process. Something different, permanent, exclusive. Either sex. 2c stamp for sample. Thoreau Mfg. Co., 1153 W. Superior St., Chicago, Ill.

GERMAN SILVER KEY CHECKS—over 35 styles. Steel alphabets for stamping names and addresses on checks, key rings, etc. Agents wanted. Price list free. Pense, Die Maker, Winchester, N. H.

NEW: 25c ALUMINUM MUCKLAGE SPREADER; marvelous seller at 25c. Agent's sample filled with several months' supply 15c prepaid. Morrison Co., Halsted & Melrose Sts., Chicago.

AGENTS: Portraits 25c, Frames 15c, Pillow Tops 35c, Sheet Pictures 5c. Best terms and prices. Oak Park Portrait Co., Oak Park, Illinois.

OLD ESTABLISHED CONCERN desires to establish agencies in all important centers for the sale of the National Water Filter. Write for particulars. Federal Filter Co., 548 West Jackson Blvd., Chicago.

HOME BUSINESS. Collect names, information, etc., for business concerns. Steady income. Instructive booklet for stamp. Information System, 259, Marietta, Ohio.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

WANTED—Sales agents for the Maxon Pat. Lever and Ratchet Screw Jacks. The best jack on the market. Kinsey & Norton Mfg. Co., Cincinnati, O.

AGENTS WANTED—New and indispensable specialty for automobile owners; quick seller; big profits; illustrated booklets; write today. R. M. Herold, Elgin, Ill.

AGENTS—GET BUSY; write today for our proposition; every housewife buys. Middle-West Supply Co., Dept. D, Ft. Scott, Kansas.

THE INSTANTANEOUS FRACTION COMPUTER; computes fractions mechanically without mental calculation. Postpaid 50c. Agents wanted. Numerometer Mfgs., 3635 Archer Ave., Chicago, Ill.

A LIVE AGENT in every town, to sell goods used in every household; write to-day. W. W. Sprague Supply Co., 100 North Cambridge, Mass.

BEST SIDE LINE ON EARTH; clean cut proposition; pocket samples; prompt commissions; consigned goods; Dyer Manufacturing Co., 1120 S. Michigan Ave., Chicago, Ill.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffert, Treas., MU, Chicago.

FREE AUTOMOBILE to agents. Address Franklin Mercantile Co., Franklin, Indiana.

\$1 INK PENCIL; as good as \$2 and \$2.50 makes. Practical; guaranteed. Agents' sample, 25c prepaid, coin, stamps; 10c clip free. Morrison Co., Halsted & Melrose Sts., Chicago.

AGENTS WANTED to sell our beautiful scripture wall mottoes. Frank Shilling Co., Navarre, Ohio.

DISTRIBUTE SAMPLES, \$25 weekly. Investigate. Mystic Company, Washington, D. C.

WANTED experienced agent to sell state rights. Big money. Box 908, Spokane, Wash.

AGENTS—Investigate our 50c household necessity, enormous sales, big profits. Jersey Supply House, Washington, N. J.

NEW ERA Combination Kettles sell at sight. Other specialties. United Supply House, Lyons, Iowa.

WANTED—Agents to sell teas and coffees. Burns & Reed, 209 Hudson St., New York.

WOULD \$45 WEEKLY INTEREST YOU? Taking orders from samples. That's the lowest weekly commissions paid any one of our representatives since April (Some earned \$85). Our goods are so beautiful and reasonable, your order is practically taken when samples are shown. If you want a fast selling line, with a chance for a Permanent General Agency and mean business, we will send you samples worth \$2.00 for \$1.00 prepaid. (Refunded if samples are unsatisfactory.) Our method (square dealings) Royal Mfg. Co., Rutledge, Penna.

GENERAL AND LOCAL AGENTS: Here is your opportunity. Energetic men can make \$2,500 yearly and up. The Improved Canchester Kerosene Mantle Lamp revolutionizes old methods. Far superior to electricity, gas, acetylene or gasoline at 1/10 the cost. Burner fits all lamps. Safe; clean; odorless. Burns with or without mantle. Tested and pronounced by State of Pennsylvania "Most efficient light found." Greatest seller known. We want a few more live men in open territory. Canchester Light Company, Dept. P. M., 204 N. State St., Chicago.

AGENTS. Men, women, everywhere, new invention just out. New Automatic Filter for cistern. Nothing like it on the market. Every home needs. Used by all classes. Women delighted. Big demand. Price insignificant. Fascinating, dignified exciting work. Everything right for enormous business. Success sure. Big profits. Write today. Automatic Filter Co., Toledo, O.

A NECESSARY ARTICLE in every home where stoves are used. Patented detachable appliance to hold the stove pipe in perfect position, preventing danger of fire and suffocation from gas. This article is very reasonable in price and sells at sight. Agents can make handsome wages. No experience required. Write for particulars. National Stove Pipe Holder Company, Ottawa, Ohio.

A BIG WINNER FOR AGENTS: 7-in-1 Nickel Plated Combination Tool Key Ring; screw driver; bottle cap opener, envelope opener, pipe cleaner, cigar cutter, nail cleaner. Most useful pocket novelty invented. Sells itself. Sample 10 cents. Joseph Mathieu, 203 Court St., Brockton, Mass.

10,000,000 U. S. HOMES NEED The Aladdin Mantle Lamp because they burn kerosene. Using less oil than ordinary lamps, the Aladdin outshines gas or electricity. Sells itself on overnight trial. Ball sold \$50 on money-back guarantee. Not one returned. Sample lamp furnished. Write quick for agency proposition. Mantle Lamp Company, Dept. 118-J, Chicago.

SIGN LETTER AGENTS—PAINTERS. Something new and better. Attracto Gold or Silver Letters. Anyone can apply them. Big money lettering store windows—making glass signs. Write today for free sample. Attracto Sign Co., Kemper and Orchard, Chicago.

AGENTS—The Novelty Fish Pond and The County Fair are two of the most fascinating game boards ever invented, 100% profit. Orders bound to repeat. Nothing like them on the market. Slot machines beat. Both games and two other crackerjacks and full particulars on receipt of \$1.50. Money refunded after orders amount to \$10.00. Unique Novelty Co., Independence, Iowa.

COMFORT-DRAWERS SUPPORTERS. Samples, ten cents. Slp Manufacturing Co., Jersey City, N. J.

WANTED—AGENTS and managers to handle new special tool. Particulars free. Gordon & Wilder, Norwood, Mass.

\$25 WEEKLY and expenses to men and women to collect names, distribute samples and advertise. Steady work. C. H. Emery, MP, Chicago, Ill.

AGENTS MANUFACTURE your own goods. Send dime for successful plan. Cherry, Myra, Penn.

O, YOU MONEY! \$25.00 daily can be made. You be the one to get the thousands of dollars. Just send postal asking for terms and free sample proposition. A revolution in Vacuum Cleaners that will be snapped up. Get in quick. Aero Vacuum Co., X12, Cincinnati, O.

LIVE AGENTS WANTED. A permanent income selling Koeth Kombination Kit, 15 tools in one. Finest tool steel, guaranteed. Big profits. Wonderful seller. Exclusive territory. Send for free sample offer and terms. Currier-Koeth Mfg. Co., 52 West St., Coudersport, Pa.

(CELLULOSIA) DOOR PLATES, new, lettering pure gold. Send for sample case. Nothing invested. 100% profit. sell to every house. Public demand them. La Fontaine, Inventor and Mfr., Sherburne, N. Y.

AGENTS—SELF-WRINGING MOPS; six styles for all purposes. New inexperienced men make \$9.00 per day. No investment. Send for exclusive territory proposition that will make you independent. Edward Hilker Mop Co., 1195-A Grand Ave., Chicago, Illinois.

EVERYBODY CAN SHINE THEIR SHOES with ease, convenience and economy by using the Kroll Patent Shoe Polisher. In tremendous demand. Agents making piles of money. Write today for exclusive territory. Adam J. Kroll, 600 Blue Island Ave., Chicago.

AGENTS—LIVE ONES, either sex, can make big money selling our three specials in furs, sell for \$10.00 per set. Write for particulars. Merchants Fur Co., 185 N. La Salle St., Chicago, Ill.

SEND 10c FOR HANDSOME SAMPLE German silver key chain, your name and address stamped thereon. Big commission for taking orders. We also supply blank stock and stamping outfits. Hart Manufacturing Co., 200 Eckford St., Brooklyn, N. Y.

WANTED! ENERGETIC MAN OR WOMAN, in every city, to advertise, deliver and collect. \$4.00 daily easily made. Experience not necessary. Steady employment to right party. Write us at once for particulars. Dexter Supply Co., 508 S. Dearborn St., Chicago.

EARN \$25 TO \$50 A WEEK, spare time. Selling braided and embroidered, lawn and lace shirtwaist patterns, Mexican drawn work, petticoats, etc. Catalogue and samples free. F. B. Smith Co., 1425 Exchange Bldg., Paterson, N. J.

LIVE AGENTS WANTED. Sure success. Sure repeat. Hundred per cent profit. For particulars address: Lincoln Contractors Supply Co., First National Bank, Lincoln, Nebraska.

A NEW NOVELTY as a leader. Start with us. Samples and catalogue free. \$5.00 a day easily made. J. C. Dodge Co., Barrington, Ill.

SALESMEN MAKING SMALL TOWNS, just what you want for pocket side-line. Something new, snappy and catchy. Quick shipments and prompt commissions. Write for order book today. State territory covered. R. Dahne, Sales Mgr., 208 Sigel St., Chicago, Ill.

AGENTS—100% PROFIT—Genuine Leather Combination Purse, Billfold, Memorandum Book, Penset, Identification Card, Sells at sight. Agents' sample 45c postpaid. LeRoy Specialty Co., 76 Park Place, Room 52, New York.

AGENTS—Our new 1911 model Incandescent Kerosene Burner 100 candlepower light—burns with or without mantle. Prices defy competition. Particulars free. Simplex Gaslight Co., New York.

SALESMAN—Traveling, to carry Garvey Fountain Stencil Brush as side line; thousands sold. American Diagraph Co., 15 N. 2d St., St. Louis, Mo.

SALESMEN, AGENTS, REPRESENTATIVES. Write White Vending Co., 1335 Van Buren, Chicago. Big commissions paid monthly, for selling our Vending Machines.

WANTED—AGENTS, 7 cents profit each 10 cent sale; best little article ever offered; sample for 3 cents in stamps. Rawlings, Box 945, St. Louis, Mo.

EXPERIENCED AGENTS. Male or female. Repeat orders. 100%. Write us. Shaver Specialty Co., Dept. L-1, Somerset, Pa.

UNLIMITED OPPORTUNITY FOR AGENTS selling automobile tire repair kit. Florence Novelty Co., Box 1, 4505, Philadelphia.

VALUABLE INFORMATION for agents, mail order dealers and beginners. Descriptive literature free. Andrew Brems, Cincinnati, N. Y.

AMAZING INVENTION—Entirely new lamp burner. Changes ordinary kerosene illumination into beautiful large white gas light. Guaranteed Smokeless. Odorless. Not a mantle. Can't break. Unlike others. Brings you quick sales, large profits. Show ten, sell nine. Only 35c retail. This territory just opened. Act now. "Radiolite," 384 Colonnade, Toledo, O.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

"AGENTS, 100% PROFIT." New Patented Automatic Razor Stopper, automatically puts a perfect edge on any razor, old style or safety. Retail at \$2. Big seller. Every man wants one. Write quickly for terms, prices and territory. P. Brandt Cutlery Co., 84 W. Broadway, N. Y. City.

AGENT'S OUTFIT FREE. Quick profits. Best Handkerchiefs, Dress Goods and Fancy Goods on the market. Large Manufacturer. Particulars for stamp. Maricopa Mfg. Co., 93 Water St., Brooklyn, N. Y.

HONEST MAN OR WOMAN WANTED in every town to represent well-known wholesale firm. Experience unnecessary. Must furnish good references. Easy, pleasant work. Fair salary to start. McLean, Black & Co., 351 Medford St., Boston, Mass.

BECOME A MILL AGENT. We manufacture Triplewear Hosiery—outwears 3 ordinary kind, replaced free when hole appears. Large profits. 1st reply obtains agency your town. Write today. Triplewear Mills, Dept. D, 724 Girard Ave., Philadelphia.

YOU CAN MAKE \$\$\$\$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, Newark, N. Y.

MEDALLIONS SELL AT SIGHT. 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

ONE MILLION AGENTS WANTED; fast seller costing 5c, selling 50c. Every firm needs. Orders to \$30. Postal brings samples. Embossed Co., 2497 Milwaukee Ave., Chicago.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 202 S. Clark St., Chicago.

WIDOWS, Ladies, Men, New Interesting. Profitable, easy work. Spare time or permanent. Sell our useful specialties. Our original selling plan will double your sales. Particulars and \$2.00 premium offer free. Fair Mfg. Co., HF51, Racine, Wis.

AGENTS TO COVER EXCLUSIVE TERRITORY and sell physicians. Established line, liberal commission, weekly advance. Address Reiman Company, 1123 Broadway, New York.

MATCH VENDING MACHINES Sell Easily Everywhere. Agents paid liberal commissions. Geo. A. Bayle, Second and Elm Sts., St. Louis, Mo.

I MADE \$18,000 in three years in mail order business. Letter booklet free, tells how. H. System, 125, Marion, Ky.

AGENTS TO SELL new Automatic device. Big profits. Unworked field. Write today for our profitable offer. Superior Wrench Co., Box 900, Marshalltown, Iowa.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

SIGN PAINTING AGENTS. 1000% profit. Best and cheapest Window Letter made. Easiest mounted. Outfit free. Success positively guaranteed. Embossed Letter Co., 2563 Milwaukee Ave., Chicago.

AGENTS—BOTH SEXES—We manufacture and control the fastest selling household specialty ever invented. P. M. Connelly, 123, Liberty, New York.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R., Cincinnati, Ohio.

SELF-THREADING NEEDLES. 10c a paper. Agent's samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

AGENTS! If you are after \$\$\$, better write us. Formosa Mfg. Co., Thibodaux, La.

HANDY RAT TRAP. Great agents' seller. Terms free. Zerbe, Sacramento, Pa.

HELP WANTED

WE START YOU IN a permanent business with us and furnish everything. We have new easy selling plans and seasonable leaders in the Mail Order line to keep our factories busy. No canvassing. Small capital. You pay us out of the business; large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. J. M. Pease Mfg. Co., 191 Pease Bldg., Michigan St., Buffalo, N. Y.

\$5,000 TO \$10,000 YEARLY in the real estate business, without capital; we will teach you the business by mail, appoint you special representative in your locality, of leading real estate company, list with you readily salable properties, co-operate with and assist you to permanent success; a thorough commercial law course free to representatives. If you are honest and ambitious, our free 62-page book will surely interest you. Address International Realty Corp., Dept. 1834, Chicago, Ill.

WANTED ONE THOUSAND CHAUFFEURS and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$20.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1609 Michigan Ave., Chicago.

WHY NOT PREPARE for Civil Service Examination? Teaching? Stenographer? Bookkeeper? Stationary Engineer? Electric Wiring? Electrical Engineer? Mechanical Engineer? Mechanical Draftsman? Electric Wiring? Matriculation, \$5. Tuition free. Mail course. Address Carnegie College, Rogers, Ohio.

MEN WANTED FOR GOVERNMENT POSITIONS—Influence unnecessary. Average salary, \$1,100. Annual vacations. Short hours. Steady work. Rapid promotions. Thousands of appointments coming soon. Send postal immediately for list of positions open. Common education sufficient. Franklin Institute, Dept. N-21, Rochester, N. Y.

IDEAS HAVE MADE FORTUNES. On request I will send my "Inventor's Pocket Companion," telling how to use Your idea to greatest advantage. Patent Secured or Fee Returned. Write today. Wm. N. Roach, Jr., 502 Metzger Bldg., Washington, D. C.

MEN WANTED FOR GOVERNMENT POSITIONS—October examinations everywhere. Influence unnecessary. \$90.00 a month. Annual vacations. Write for list of positions open. Franklin Institute, Dept. N-21, Rochester, N. Y.

WANTED DISTRIBUTORS of advertising matter everywhere. Oliver D. Barkley, Mount Pleasant, Pennsylvania.

MEN WANTED FOR GOVERNMENT POSITIONS—October examinations everywhere. Influence unnecessary. Average salary, \$1,100. Annual vacations. Send immediately for list of positions open. Common education sufficient. Franklin Institute, Dept. N-21, Rochester, N. Y.

WANTED—ACTIVE MAN OR WOMAN, each locality. To join this society, and introduce our memberships. Sick. Accident. Death Benefits. All or spare time. \$50 to \$500 a month. Every member secured gives steady monthly income. Box GA-293, Cornington, Ky.

SALARY OR COMMISSION. Lubricating oils, auto oils, greases, house, barn and roof paints, hundred other specialties, all winners. Big inducements. Address Desk A, Inland Oil Works Co., Cleveland, Ohio.

YOU ARE WANTED for Government position. Salary \$1,100. Send postal for list of positions open. Franklin Institute, Dept. N-21, Rochester, N. Y.

BOILER ROOM SPECIALTY. Leading manufacturer wants an exceptionally high grade salesman, capable of selling \$100 specialty to large power plants. Minimum com. on each sale, \$25. Ladd, 885 Niagara St., Buffalo, N. Y.

GOVERNMENT WANTS EMPLOYEES. Write for list of positions open. Franklin Institute, Dept. N-21, Rochester, N. Y.

DANDY HOME BUSINESS. Collect names, information, etc., for business concerns. Steady income. Fascinating work. Instructive booklet for stamp. Information System, 260, Marietta, Ohio.

WANTED—CLERKS, by U. S. Government, October examinations everywhere. Preparation free. Write immediately. Franklin Institute, Dept. N-21, Rochester, N. Y.

7,000 GOVERNMENT POSITIONS OPEN. Write for list. Franklin Institute, Dept. N-21, Rochester, N. Y.

GOVERNMENT POSITIONS offer steady, pleasant employment, big pay. Influence unnecessary. Get your preparation from former U. S. Civil Service Examiner. Write for big, free, descriptive booklet. Patterson Civil Service School, Box 936, Rochester, N. Y.

WANTED SALESMEN to sell Gasoline Lighting Systems; no experience necessary; attractive proposition. Doud Lighting Co., 174 No. Sangamon St., Chicago, Ill.

WE TRAIN DETECTIVES. You can be one. Splendid opportunities. Travel. Earn \$100 to \$300 monthly. This fascinating profession taught practically and scientifically by mail at a nominal cost. American School of Criminology, Dept. F, Detroit, Mich.

WANTED MAN IN EVERY SHOP to do special work for us. Good pay. Will not interfere with regular work. P. Seewagen, Dunkirk, N. Y.

WANTED, AGENTS, MACHINISTS, ATTENTION! Increase salary, new revised Saunders' Hand Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

STOP HERE! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

WANTED—A man or woman to act as our information reporter. All or spare time. No experience necessary. \$50 to \$300 per month. Nothing to sell. Send stamp for particulars. Sales Association, 601 Association Bldg., Indianapolis, Ind.

I MADE \$18,000 in three years in mail order business. Dollar booklet free, tells how. H. System, 125, Marion, Ky.

MACHINERY AND TOOLS FOR SALE

HAVING CHANGED OUR FACTORY to individual motor power we have some snags in second-hand equipments. 1 20-hp. Fairbanks-Morse gas engine run less than one year, \$225.00; 1 11x16 slide valve Atlas steam engine, \$80.00; 1 Williams, White & Co. hull dozer, cost \$350.00, will take \$150.00; 1 planer, good condition, \$50.00; 1 28-in. diam. 2 11/16-in. bore friction clutch, never been uncrated, \$15.00. Two large iron pulleys, one 60-in. diam., 24-in. face, 3 7/16-in. bore, the other 84-in. diam., 12-in. face, 3 7/16-in. bore, also 13 ft. of 3 7/16-in. shafting with 2 ring end bearings; make a bid. Lot of wood split pulleys ranging in size from 24-in. diam., 8-in. face, to 44-in. diam. 17-in. face, will sell any or all cheap. Several 10-hp. air cooled automobile engines good as new, \$50.00 each. New steering gears at \$10.00 and used ones at \$6.00, also 5 new automobile seats at \$5.00 each. All F. O. B. here. M. M. Johnson Co., Clay Center, Neb.

FOR SALE by The Patterson Tool & Supply Co., Dayton, O. One Goodell Pratt Bench Lathe, with slide rest and chuck fitted; 1/2-hp. Sterling DC 110-volt motor, all mounted on neat work bench; fine condition, \$60.00.

REBUILT MOTORS—We have a number of second-hand marine engines of our own and other makes, completely rebuilt and guaranteed by us. As the builders of "Buffalos" are not in the second-hand engine business, we will sell them at less than factory cost to make room. This is a rare opportunity to get the highest grade of engines—2 to 100-hp.—cheap. Buffalo Gasoline Motor Co., 1284-96 Niagara St., Buffalo, N. Y.

ONE 3-HP. VERTICAL 4-cycle stationary gasoline engine, also one 3-hp. horizontal engine; both water cooled. Price \$50 each. Also one 12-hp. horizontal on trucks, never was used. Price \$200. Split & Boettcher, Manitowoc, Wisc.

FOR SALE—Two water-tube boilers, 100-hp. each, Heine type; three tubular boilers, 65x18; perfect condition and cheap. Address Armstrong Mfg. Co., Springfield, O.

FOR SALE by The Patterson Tool & Supply Company, Dayton, Ohio, 50 16-in. Cast Iron Pulleys, 1 7/16-in. bore, for 2-in. belt, turned, faced, balanced, and set screwed.

FOR SALE—1-hp. Gasoline Engine, No. 4 Barnes Lathe, Speed Lathe, Power Hack Saw, Sheep Shearing Machine, Forge, Blacksmith Tools, etc. A. W. English, Wyeocena, Wis.

FOR SALE by The Patterson Tool & Supply Co., Dayton, O., a new 12-hp. Alamo Gasoline Engine, \$350.00; one 8-hp. Dayton Upright Gasoline Engine, good order, \$60.00. One practically new 10-hp. Callahan Gas or Gasoline Engine, \$900.00.

\$28.00 TAKES 3-HP. four-cycle marine engine with accessories; \$78.00 takes 20-hp. two-cyl. water cooled auto motor with accessories. Badger Motor Co., Milwaukee, Wis.

WALLACE HERMAN, 112 Alberta Ave., Dayton, Ohio, has a dandy 7-in. swing, wood-turning lathe for \$4.50. Send stamp for photo.

FOR SALE—\$1,030 Coffin Hardware Machine, used 3 months, take cash \$750. E. Stallings, Euclid, N. C.

FOR SALE—4-cylinder 24-hp. engine, 4-speed planetary transmission, very near new, make offer. 200 West 5th, Newton, Kan.

FOR SALE—Five-hp. Gasoline Engine, in good running order, also one chest patternmakers' tools. O. A. Wenbers, Batavia, Ill.

13 5-HP. STEAM ENGINES \$12.00 each. Lucas & Son, Bridgeport, Conn.

FOR SALE—1 24x27 7-ft. iron planer. W. J. Ferrell, Barberton, O.

ELECTRIC MOTORS—1/15 to 1/4-hp. Cheap, for sale. Cosmos Electric Co., 134 Liberty St., New York.

FREE, on ten days' trial, three horse power gasoline engine, no money down, 5 years guarantee. Welding of any broken parts of machinery. Particulars. Welding Co. & Tool, St.

HARRISON KEY FILING JIG (Improved). The most practical tool on the market; saves blanks, no misfits, no experience necessary; anyone can make a duplicate key with this tool, and price within reach of everybody. Factories, office buildings cannot afford to be without one. Harrison & Co., 81 New St., N. Y.

INTERESTED IN GASOLINE ENGINES? Send 50c for booklet, "How to Run and Install Gasoline Engines," and a year's subscription to Gas Energy, 28 Murray St., New York.

BARGAIN: Steam boiler, engine separator, churns, vats, butterworker, H. Smith, Rayanna, Missouri.

PULLEYS, GEARS, SPROCKETS, Shafting Hangers; see page 150. W. A. Jones Foundry & Machine Co., Chicago.

FOR SALE—Rebuilt: Throttling, Automatic and Corliss Engines, Boilers, Pumps, Heaters, Machine Tools, Tanks, Saw Mills, and general machinery, at bargain prices. Let us know your wants. The Randle Machinery Co., 1761 Powers St., Cincinnati, Ohio.

VERTICAL STEAM ENGINES, 2 to 25 hp. Send for circular, E. T. Frank & Son, 642 W. Pratt St., Baltimore, Md.

ENGINE CASTINGS, 1½ horse vertical gasoline, air-cooled, \$7. Three horse marine water-cooled, \$9 cash; drawings included; catalogue for stamp. Novelty Manufacturing Co., 853 West Sixth St., Cincinnati, Ohio.

STEAM BOILER OUTFITS Complete; 1½ Horse Power 20" diam., 51" high, \$40.00. Page Boiler Company, 815 Larabee St., Chicago.

FOR SALE—Gasoline Engines, automobiles, marine and stationary, also castings. Second hand ones taken in exchange and for sale. Apply with stamps. B. W. Richardson, R. No. 36, Peoria, Ill.

FOR SALE—Engine lathe, swings 9½ in., takes 25 in. between centers. Complete with full set change gears to cut all size threads, 3 to 40 in.; price only \$43.50. Address L. F. Grammes & Sons, Allentown, Pa.

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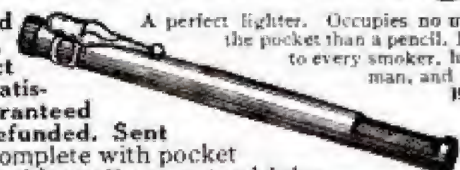
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Second Prize—JOHN MASON, Armstrong, Okla. \$5
"Thawing a Frozen Pipe"

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JOSEPH GLESON, Milwaukee, Wis. \$5
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HARRY L. BERRY, Philadelphia, Pa. \$5
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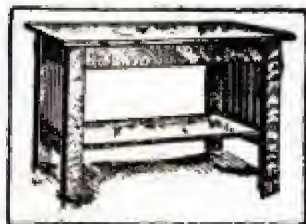
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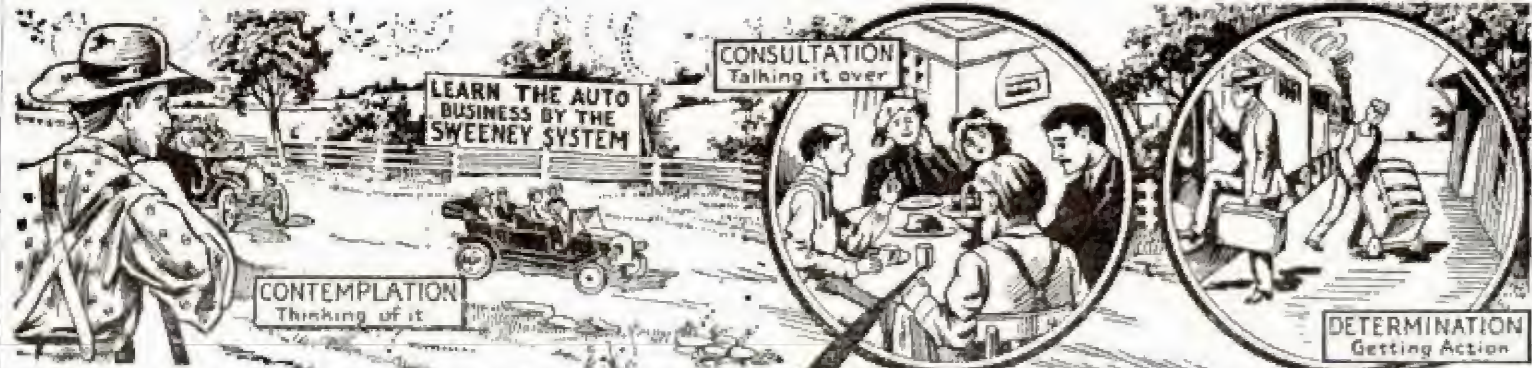
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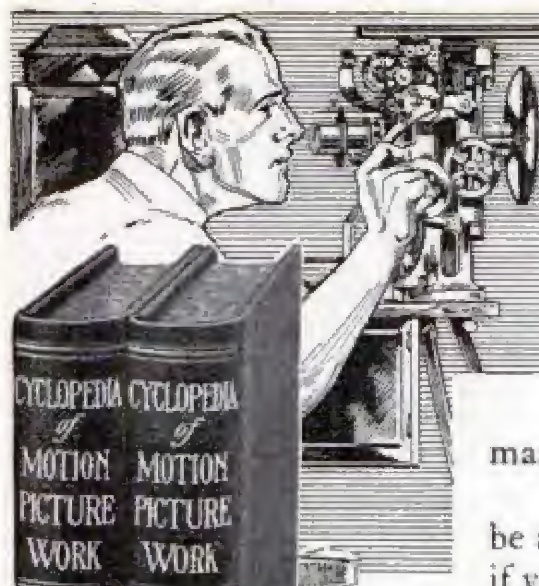
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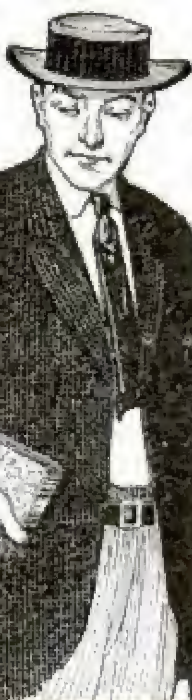
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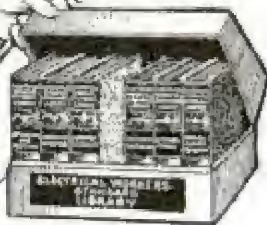
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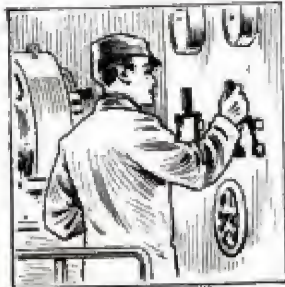


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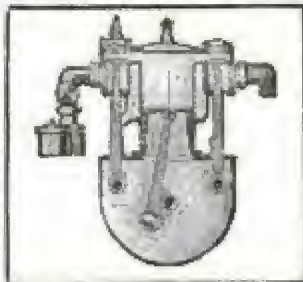
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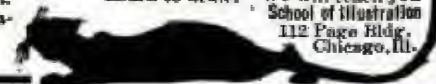
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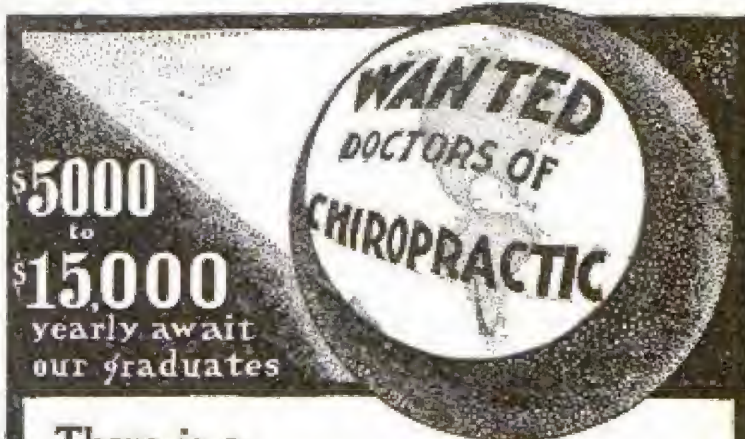
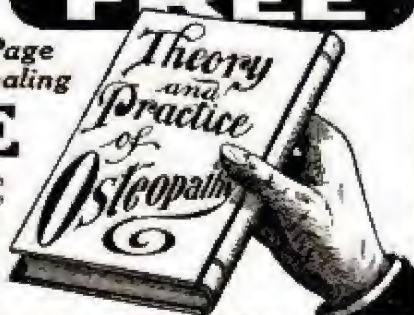
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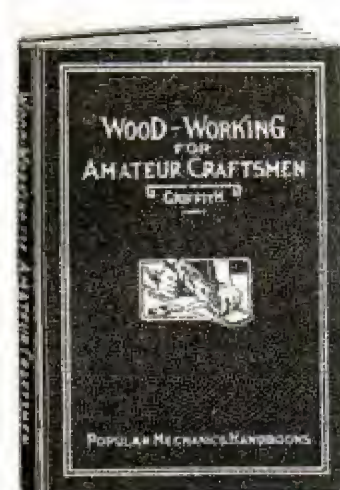
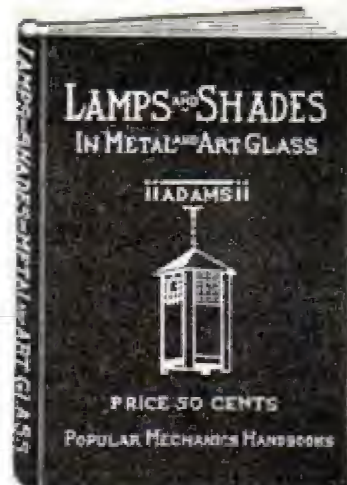
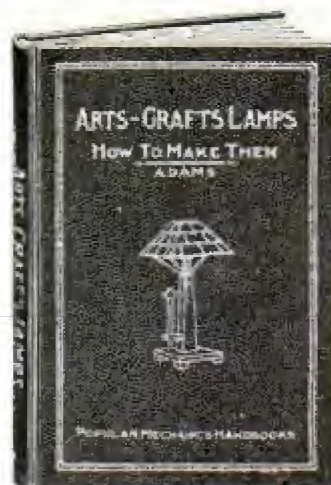
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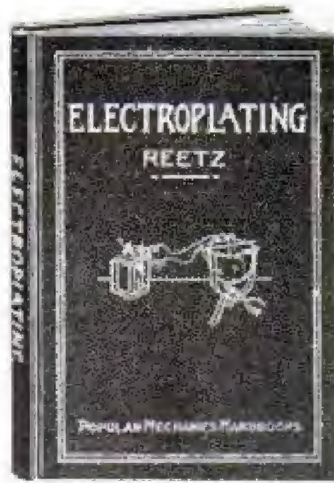
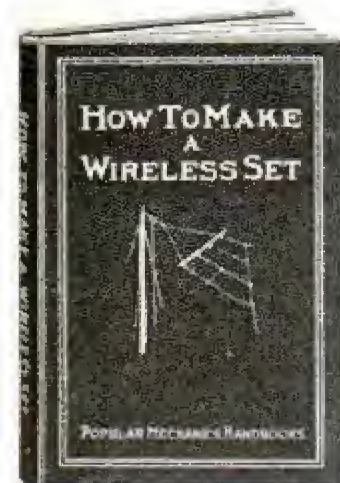
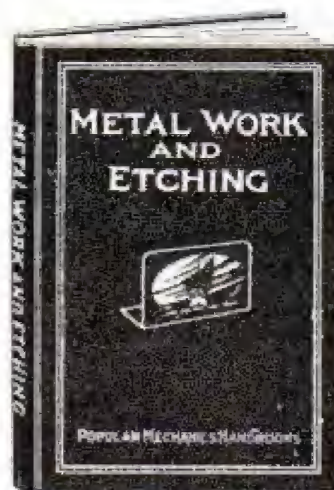
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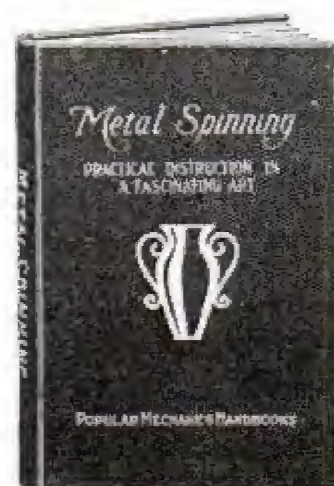
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Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 16

OCTOBER, 1911

No. 4

Schoolhouse With Direct Exits From Every Room



New Fireproof Building Erected Beside the Site of the Collinwood, O., School in Which 175 Children Were Burned to Death. It Has Many Novel Features

A SCHOOL building in which every room has a direct connection with the ground, without first entering the main hall, has been built just beside the site of the famous Collinwood, O., school in which 175 children perished by fire in 1908. It represents many unique features of construction and is said to be as fireproof and panic-proof as it is possible for a school building to be.

There are 12 large class rooms and a spacious auditorium in the new building. Between each two rooms a cement stairway extends straight down to the ground, making it possible to empty the entire building in two minutes without using the main halls,

and with never more than two classes coming in contact with each other. The stairways from the rooms on the first floor are directly under the stairways from the second floor. Doors at the ground exits open on the slightest pressure.

Steel doors are used at the main entrances and steel doors also separate the class rooms from the halls. Door and window casings are of steel. The floors are laid on concrete and the roof is concrete. The corridors and cloak rooms have cement-finished floors.

Each room is ventilated without the necessity of opening a window. An electrically operated fan, 12 ft. in diameter, provides the ventilation. Heat

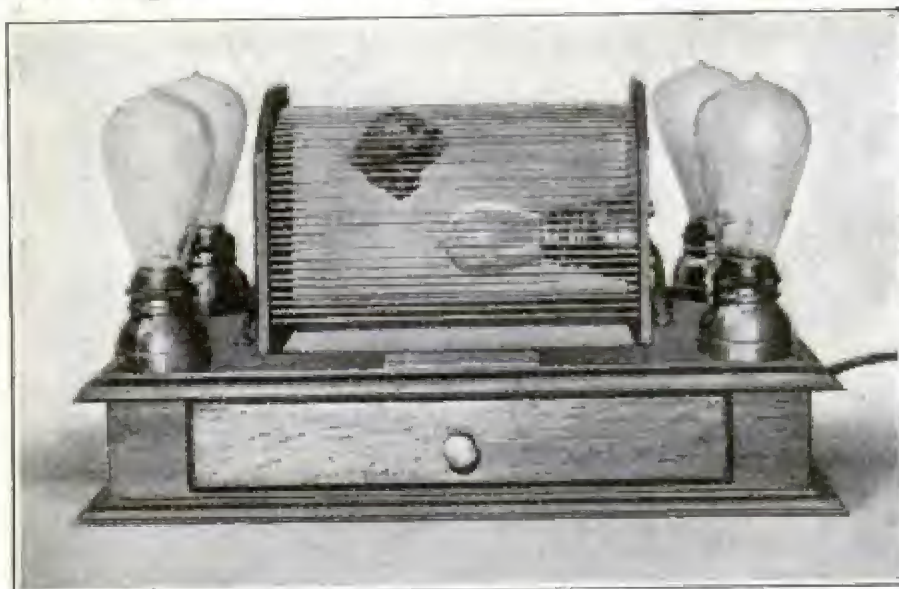
is furnished from a separate building and passes beneath the floor in brick ducts. An even temperature is preserved by automatic devices.

The auditorium of this building is circular in form, is directly on the ground, and has no balcony. There is a glass dome in the center for light. Seven exits lead from this room.

The building cost about \$85,000. It is 155 ft. wide and extends back 180 ft., is two stories high, and above the stone foundation is built of brick and terra cotta. On the adjoining ground and directly on the site of the great fire, a memorial park, 140 by 500 ft., is for flower gardens, shrubbery, decorative trees and lawn.

AN ELECTRIC DEATH TRAP FOR THE FLY

The latest effort in the "swat-the-fly" campaign is an electric death trap which although clever in conception and design seems too expensive ever to



The Flies are Supposed to be Attracted by Bait within the Cage and be Electrocuted When They Attempt to Get at It

come into more than very limited use.

The idea was originated by two young Denver men. The apparatus stands on a 10 by 15-in. base and comprises an arrangement of wires $\frac{1}{16}$ in. in diameter and $\frac{1}{8}$ in. apart. Electric current of 450 volts—which ordinarily would require some auxiliary apparatus to obtain—is turned on through these wires, and the flies are attracted within the cage by a piece of meat or other suitable bait. The lamp inside serves also to draw the flies, the external lamps being employed to prevent damage from short-circuiting of the current when the flies are electrocuted.

BLOW OUT THE GAS NOW WITHOUT DANGER

In these days of electrically lighted hotels, one does not hear so much of the foolish person who blows out the gas to the imminent danger of losing his own life by asphyxiation or of blowing up the building. But any danger that now exists with gas installations, in spite of more widespread information on the subject and the familiar printed warning "Don't Blow Out the Gas," can now be avoided by the use of a foolproof, self-closing gas valve, which automatically turns off the gas when it is blown out.

The new burner is simple and automatic. A hinged valve is opened by pressing down a spring-controlled plunger after the main gas cock is opened. When the gas jet is lit, the steady pressure of the gas serves to keep this valve open, but when the gas is blown out, the sudden rush of gas out of the burner unbalances the pressure on the automatic valve which promptly closes and remains shut under its own weight and the pressure of the gas behind it.

ⒸThe ties used on the Panama railroad are all hardwood and most of them are *lignum-vitæ*. This wood is so hard that it has to be bored for the spikes that fasten the rails, a special form of screw spike being used.

AUTOMOBILES TO CARRY TELEPHONE SETS



The Telephone Box is on the Pole 25 Feet in Rear

If the efforts of a new western company prove successful, the automobilist will no longer dread a breakdown in an isolated part of the country miles away from the nearest town or settlement, for he will be able to walk to the nearest road-telephone station, plug in his portable instrument and call up the nearest telephone exchange for assistance, or even make a long-distance call should that be necessary.

The instrument that will make such a desirable consummation possible is called the "autophone." It



One of the Roadside Telephones

Man in Automobile is Using Instrument Attached to It

consists of two parts, the hand set that comprises the transmitter and receiver, and a ringer box containing the buzzer, magnets, condenser, battery, induction coil, and jack (terminal or junction piece). The box weighs but 5 lb., and this miniature set will enable one to talk over all kinds of lines, by simply plugging in at a small box mounted on a telephone pole on the road. It is proposed to establish these boxes on the poles at intervals not exceeding two miles, on the road, and every five or six blocks in the cities. Sub.

scribers will be charged a flat monthly rate for such service.

It is intended to install boxes on all

the main traveled roads and mountain passes in the west, and eventually to extend the system all over the country.

NEWEST STYLE FOR WOMEN LIKE KNIGHT'S ARMOR

Whether due to an awakened interest in Joan of Arc or the suffragette movement, Paris fashion molders have



not as yet announced, but their ultra fashionable models this year include a gown for women that bears unmistakable resemblance to the chain-mail armor of the knights of old. The designers of the garment admit that the chain-mail idea is the one they wish especially to emphasize. The dress is for evening wear and is an ex-

ample of simplicity in the extreme. It is the bodice or waist that carries the central idea of the designers. The skirt is perfectly plain and built on absolutely straight lines with a short train.

VALUABLE DISCOVERY IN PROPELLER DESIGN

Experiments in the Washington experimental ship-model tank, by Naval Constructor W. D. Taylor of the United States navy, have led to an important discovery which upsets previously accepted theories on the behavior of high-speed ships' propellers and paves the way to the designing of high-speed propellers of greatly increased power and efficiency, with cor-

responding increases in ships' speeds and savings in the coal bill.

The principal cause of inefficiency in high-speed propellers and fans is the formation of a partial vacuum on the faces of the blades, this phenomenon being known as "cavitation." The cavitation which occurs on the backs of the blades was found not to have any injurious effect. Mr. Taylor discovered that cavitation on the driving faces of the blades could be largely reduced by serrating the leading edge of the propeller and introducing ribs extending from the middle of the blade at the back to the point of each tooth, thus confining the face cavities to narrow rings around the leading edge.

In the case of torpedo-boat destroyers, the new propeller is estimated to make a difference of one knot (1.1515 miles an hour) in the speed, or a saving in power of 10 per cent.

LIFE-SAVERS HOLD THEIR FIRST CONVENTION

The life-savers of the country, whose business of yanking drowning persons from a watery grave has ordinarily been regarded as a matter of course at summer resorts throughout the country, formed an organization at a national convention held on the Atlantic Coast during the summer. The convention was the first of the kind that was ever held in this country and during its course many thrilling exhibitions were given. The women life-savers attracted more attention than the men during the various contests held in connection with the meeting. Difficult rescues, throwing life lines and life buoys, and many other feats of skill the members of the corps are supposed to perform in their daily work, were reproduced, and prizes awarded the most skillful. Before the close of the meeting steps were taken to form a permanent organization.



A Feature of the Life-Savers' Convention was the Life-Buoy-Throwing Contest



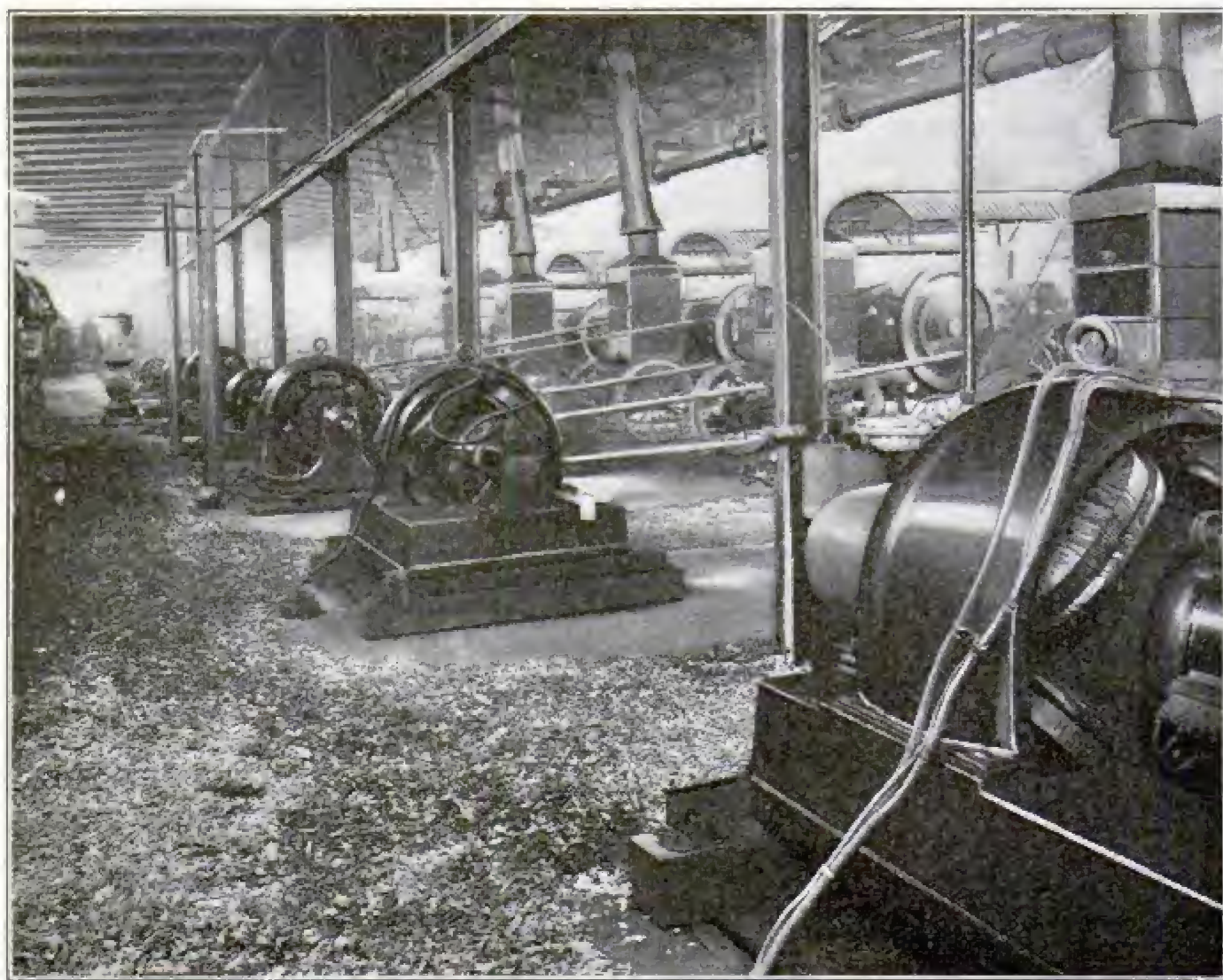
Life-Savers Competing for Prizes in Bringing "Unconscious" Bathers Ashore

RUNS FACTORY BY POWER OF ENGINES UNDER TEST

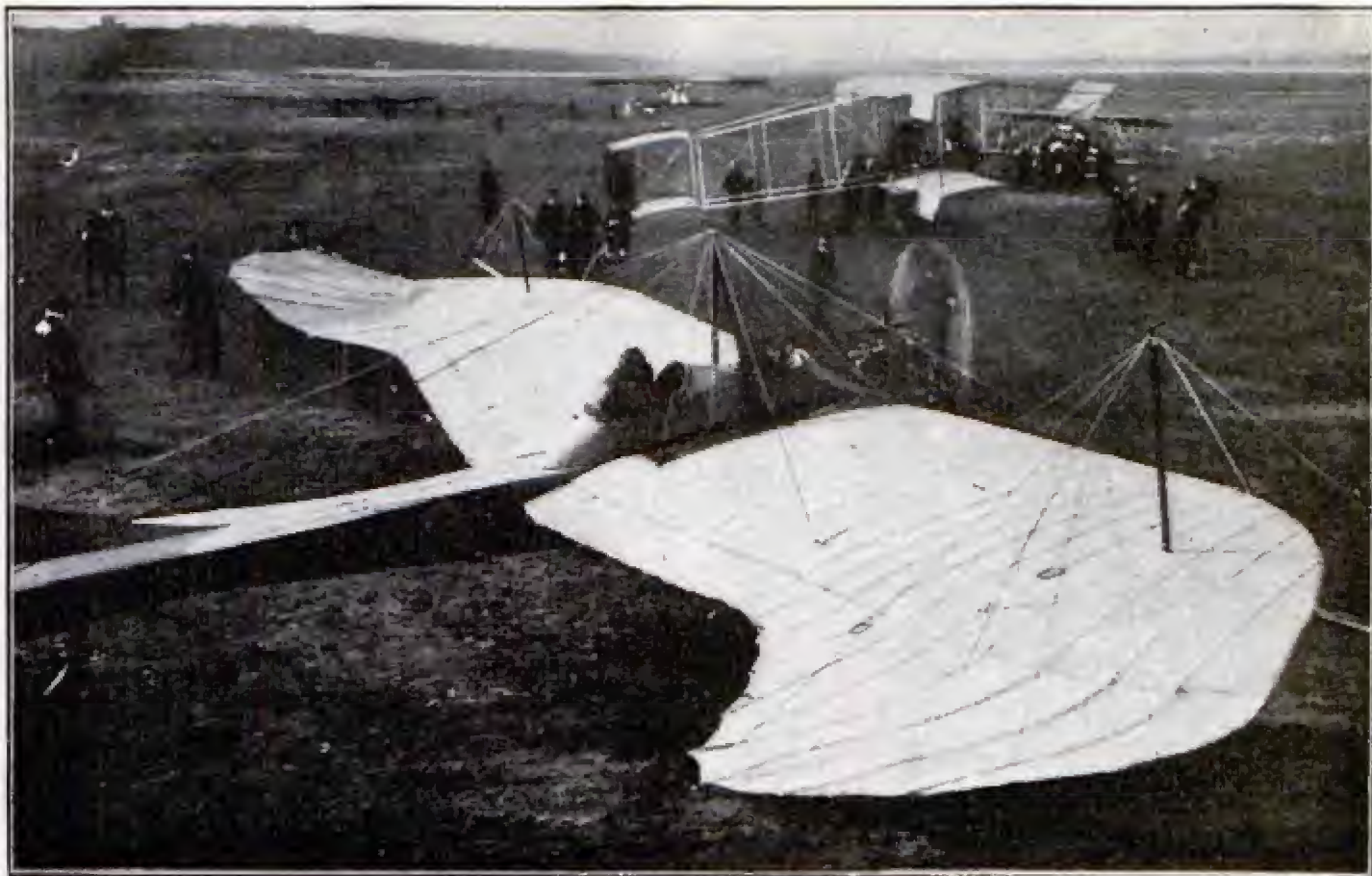
An ingenious method of economizing on the power bill has been adopted by an engineering firm in an Iowa city by using the power of the engines under test to generate electricity for light and power purposes in the factory. Naturally the engines made by this concern have to be tested to determine whether they come up to requirements, and in most factories the power generated by such machines under test is wasted. But in this case the energy has been turned to account, with material savings in the power department.

The firm in question makes farm tractors of from 20 to 80 hp. for general farming operations and turns out from 30 to 40 machines each day. Before being shipped, each tractor is

belted to a dynamo and given a run of several consecutive hours, test cards being made of the output of each tractor and filed for reference. Through switchboards the current generated during the tests is turned into the mains, thus furnishing both light and power to the factory. As the testing room provides for the testing of 14 tractors at the same time and the output from the factory keeps the testing room full all the time, it may be seen that the electrical output always amounts to several hundred electrical horsepower. Each tractor is run into the testing room under its own power and blocked up, the entire operation of taking a tested tractor out and putting in an untested one seldom taking more than ten minutes.



These Motors, Being Used for Furnishing Power, are Also Undergoing Test to Determine Whether They Come Up to Requirements. They are Changed Every Day



Vollmöller, the German Airman, in His Aeroplane, "Taube," Which Translated Means "Pigeon," So Called Because of Its Appearance. With This Machine He Won Second Prize in the Recent German Circuit

BUILDING EXPENDITURE OF THREE EASTERN CITIES

The extent to which building operations have been conducted in New York, Boston, and Philadelphia in the past five years is here given, the figure for New York being stupendous. The records of the New York building department show that in this period \$20,000,000 of new capital was expended in theaters, \$15,000,000 in hotels, and \$97,000,000 in office buildings, making a total of \$132,000,000.

Boston invested \$1,500,000 in theaters, \$2,000,000 in hotels, and \$15,000,000 in office buildings, making a total of \$18,500,000, while Philadelphia invested \$8,000,000 in the same class of construction.

ⒸThe French government has honored Airmen Alfred Leblanc and Hubert Latham with the Cross of the Legion d'Honneur, for services rendered in the advancement of aviation.

HAT PROVIDED WITH ELECTRIC FAN

An electric fan installation for use in top hats during the warm summer months has been invented. The battery will last for several days, and a renewal only costs 15 cents. The fan is regulated by a switch on the brim. Fan, motor, and battery are mounted



Electric Fan Mounted in Top Hat Keeps Head Cool in Hot Weather

on a board which is supported in the crown of the hat just above the space occupied by the head.



SWIMMERS PHOTOGRAPHED IN THE WATER

What seem like curious contortions of the human body are the result of attempting to take photographs of the aquatic performers from a position almost directly above them

ABNORMAL FEET AND A PEG-LEG



This peg-legged mule is normal in every way except as to its feet. It has six hoofs, no two of which are alike, and is compelled to walk with the aid of a wooden leg because of the exceptional malformation of its left fore foot. This foot tapers to a point, there being a hoof or toe 6 in. long at the end. Growing at right angles from the left fore leg is another leg, at the end of which is another slender hoof 8 in. long. The right fore foot has a double hoof, the right hind hoof is cloven like that of a cow, and the left hind hoof is an imperfect mule hoof. The mule is two years old.

¶The dean of the College of Chemistry of the University of Minnesota announces a method of utilizing waste wood and sawdust by means of which the United States may produce 100 times more pulp wood than was believed possible.

This Mule Has Six Hoofs, No Two of Which are Alike, and Walks with a Wooden Leg

POSSUM FARMS STARTED IN AUSTRALIA

The possum is no longer the humble little animal he used to be. First came presidential recognition and now more honors have fallen upon him. Australia has recognized his commercial value, and numbers of possum farms have been started in that country. One farm exclusively for them has been started in the eucalyptus bush land of Victoria, and in Western Australia a company has been formed for the breeding of the possum on a stretch of eucalyptus country comprising about 200,000 acres of land.

INTERNAL-COMBUSTION RIVETING MACHINE

An ingenious type of riveting machine just developed in Europe operates on the principle of the internal-combustion engine, an explosive mixture of air and gasoline vapor being forced into the working cylinder of the riveter by means of a small electrically driven pump.

The operation of closing the rivet is simple, the first action being the throwing of the switch which causes the motor-driven pump to force the explosive mixture into the working cylinder. This pressure drives the die forward until it touches the rivet, then the pressure accumulates in the cylinder until it rises to a fixed value, when a small plunger actuates the motor switch. This stops the mixture pump and causes an ignition device to spark, an explosion occurs, and the pressure closes the rivet.

It is claimed that the cost of operating the machine is about one-twentieth that of a pneumatic riveter.

DUAL CONTROL BIPLANE MADE BY CURTISS

One of the recent products of the Curtiss experimental workshops at Hammondsport, New York, is a dual control biplane in which the controls

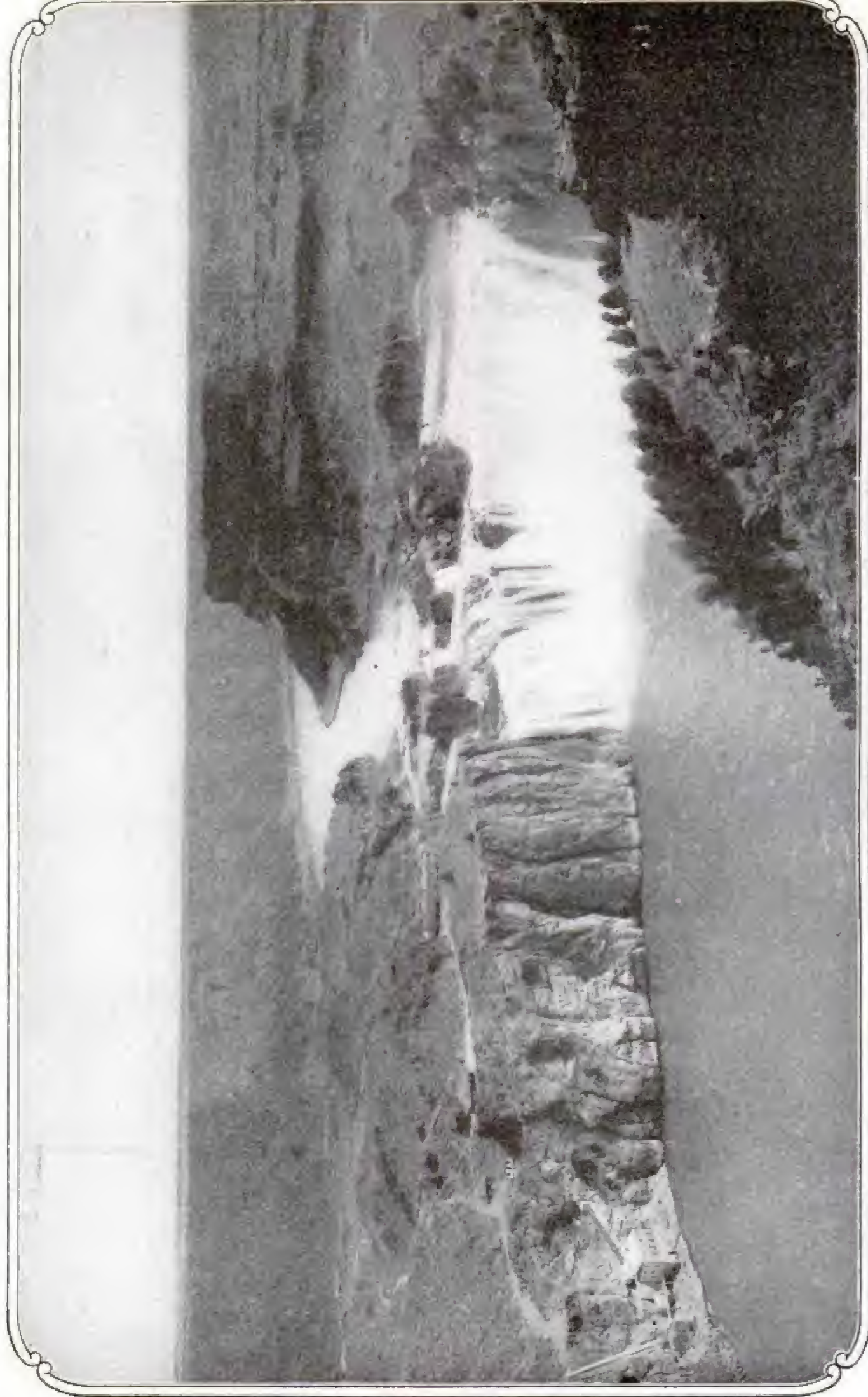


Signal-Corps Officers in Dual Control Curtiss

can be shifted back and forth between two operators sitting side by side. This is especially useful for teaching purposes. One of these machines has been delivered to the army and is now at College Park, Md., where the signal-corps officers are receiving instruction in aviation with a view to the use of aeroplanes in warfare. As is shown in the illustration, the control column is mounted on a pivot.

CAST-STEEL PLATES OF EXTREME HARDNESS

The Krupp works at Essen, Germany, has recently turned out cast-steel plates for safes and vaults of such extraordinary hardness as to be absolutely proof against drilling, and nearly so against the oxy-acetylene blowpipe. Tests show that to make a hole of 3.15-in. diameter through a plate of half that thickness by means of the oxy-acetylene method would require 8 to 14 hours of hard work, and the consumption of from two to three 154-lb. tanks of compressed oxygen, and a somewhat smaller quantity of acetylene gas. This would seem to be enough to discourage a safe-blower, no matter how devoted to his calling.



THE SHOSHONE FALLS, IDAHO

"The Percentage of Free Power Existing in Waterfalls and Streams . . . Which is Now Being Utilized is Yet Very Small; But Why Scold About It When We are Making More Progress in This Line in a Single Decade Than was Formerly Made in a Century?"



Are We Really a Wasteful People?

By OSCAR P. AUSTIN

Chief of United States Bureau of Statistics

IS wastefulness distinctively an American habit? The writer does not belong to the class of persons who believe that whatever is wrong. The habit of "knocking" everybody and everything, of asserting that all the things which are happening are wrong, of bewailing conditions of today as worse than those of yesterday and worse among our own people than those of some other country or community, is too prevalent. The tendency toward the "yellow" in every discussion of conditions in our own country, of searching up and down the land to find some means of leading Americans to think ill of their own people and their own country, is unfortunate. It is worse than that, it is positively bad. It destroys respect for our own people and their institutions, it destroys pride of country, it is destructive of patriotism. And much of it, much of the criticism of things American, of the things of today as compared with those of yesterday, is based upon misconception, inaccurate inferences, inaccurate statements.

I have been asked to discuss for Popular Mechanics Magazine the subject of "Wastes," and in considering the statements upon this subject upon which this country has been fed, I find myself unable to fall in line and join in the cry that everything is wrong and that everybody in America is lacking in the qualities of common sense and good business judgment.

Of course there is waste. So there is everywhere. But is it not a law of nature that certain of its products go back to the original elements and would not the energy devoted to preventing much of this waste be of itself a greater waste? For instance, I find the statement that one gentleman who is an inventor of waste-preventing devices is of the opinion that among the greatest wastes in America are corn cobs, corn stalks, broken glass, and waste leather straps. But is this true? If the corn cobs are worth preserving and utilizing as fuel and the stalks for paper-making, why does not capital set itself about the preservation of them? Millions, yes, hundreds of millions of American capital are seeking investment in any line which will guarantee a return of from three and a half to five per cent per annum; and the American inventor is the most resourceful and energetic in all the world. Yet this combination of invention and waiting capital has failed to produce a method by which these elements can be made useful, except by creating a "waste" of money still greater in value than their return to enrich the soil upon which they grew. In other words, with all the thought which the restless American inventors and the American investors, by thousands, have given to this form of "waste" which is constantly before their eyes, no plan has been devised by which these articles can be profitably utilized. Is it, then, a "waste" to let them decay and go to enrich the earth which produces the next crop, or would it be any less a "waste" to spend two dollars of accumulated capital in producing one dollar's worth of material from them?

Another favorite theory with those who complain of the "waste" of everyday life is that we are permitting countless millions of horsepower to waste in our streams and waterfalls every year. True, but are not conditions being greatly and rapidly improved in this particular? Are we not doing



THE GREAT ROOSEVELT DAM

"Millions of Dollars Worth of Waterpower are Now Being Utilized Because Man Has Just Learned How to Harness That Power"

wonderful things in transferring our natural power, that of the waterfalls and rivers, into electricity with which to operate our railways, light our cities and homes, and perhaps also heat them? Millions of dollars worth of waterpower, wasted through centuries of time and countless generations, are now being utilized because man has just learned how to harness that power and carry it to the place where it can be utilized. To be sure, the percentage of the free power existing in waterfalls and streams and tides and air currents which is now being utilized is yet very small; but why scold about it when

we are making more progress in this line in a single decade than was formerly made in a century?

And why is it that so much of this free power is still being permitted to go to waste? Simply because those who are seeking investments for their capital, who are carefully studying the subject with the aid of the best scientific men of the country and of the world find that a more rapid development of the process of transforming this "waste" power into usable condition would produce another waste, still



"It is a Well Known Fact That the Fire Losses are Being Steadily Reduced as the Quantity of Wood Used is Decreased"

Another set of professional "knockers" bewail the "waste" which is being devoted year by year to the construction of great navies. "Millions of money," they cry, "are being absolutely wasted in the building of battleships and cruisers and all the equipments of naval warfare." Is not the construction of warships chiefly for the purpose of preventing the destruction of property and perhaps the lives of the people who are paying for them? The purpose of the great battleship, of the navy of today, is to prevent war rather than make it, and the few million dollars put into the battleship may prevent a waste of perhaps ten, perhaps a hundred times as much in wars, which are averted by the existence of the battleship, to say nothing of the prevention of the waste of human life which would come from war.



"The United States Still Has More Forests . . . Than Any Other Country in the World Except Russia"

We are told that we are wasting our coal by the neglectful methods of mining, by using too much of it to get certain results; that only a small per-



COMPLETING THE NEW BATTLESHIP "FLORIDA"

"The Purpose of the Great Battleship of Today is to Prevent War Rather Than Make It"

centage of its "energy" is utilized in turning it into steam or heat or light. Undoubtedly a large percentage of the coal is left in the mine, another large percentage is so mixed with rock or dirt that it is not utilized, and another large percentage of its energy is lost before it is transformed into the service of man. Yet the greatest scientists of the world have thus far been unable to devise methods by which it can be more fully utilized without a greater waste of that other form of energy, capital.

We hear frequently much about the fact that our losses by fire in the cities of the United States are much greater than in Europe, and the professional fault-finders see in this another opportunity to scold the people of the United States for their "wastefulness" as compared with other countries of the world. But do they not realize that the buildings in American cities are to a much greater extent constructed of wood than in the European countries in which the supply of this inflammable material was long ago so greatly reduced that wooden houses in their cities are much less frequent than in the United States? And is it not a fact that the proportion of the structures now being built in which wood is the chief factor is very much less at present than a decade or several decades ago? It is a well known fact that the fire losses in the United States, while much greater, proportionately, than in European cities, are being steadily reduced, and as the quantity of wood used in buildings in the cities is proportionately decreased we are proportionately approaching the low rate of fire losses existing in European countries.

A few months ago we were told by a well known "business organizer" that the railways of the country are wasting hundreds of millions of dollars every year by bad business methods, and that the prices at which they are carrying people and merchandise might be readily reduced if they would only adopt his plans of management. Probably he may be right, but where in all the world can be found a more able, intelligent, thoughtful, and energetic class of men,—who go to the bottom of every business proposition, who realize more fully the importance of economies in small things as well as greater things,—than those employed by the railways of the country, of the world, in fact?

No thoughtful man who watches the progress of events in our own country or abroad can fail to observe that the advance in prices has been much less, proportionately, in manufactures than in foodstuffs, or raw material, or labor. This steadying of the price of the finished article during the very period in which the raw material and the labor through which it is produced are rapidly advancing is the result of economies of production and distribution, of a reduction of the "waste" formerly practiced in such production; and yet the public complains that these economies are driving the small tradesman out of business, not realizing, apparently, that the prevention of this waste of former years has, at the same time, precluded the necessity of advancing the price of the finished article in the same proportion as that of the raw material, the labor employed, or the food consumed by those engaged in its production.

The newspapers and other reformers located in the bituminous coal regions indulge in periodical outbursts about the waste resulting from smoking chimneys, and declare that it could be averted by the use of smoke-consumers. Perhaps; but where are the practical smoke-consumers, the application of which will reduce the waste now in progress in this line? We have been hearing of them for more than a quarter of a century, but meantime capital has been vainly searching for them, for if there is anything that the shrewd capitalist most desires it is to keep down his expenses, and he is willing to



"We Hear Frequently Much About the Fact That Our Losses by Fire . . . are Much Greater Than in Europe"



"But . . . the Buildings in American Cities are to a Much Greater Extent Constructed of Wood"

pay large sums to those who will help him to do it through a reduction in any waste now in progress. But if the waste of money in adopting waste-preventing devices is greater than the waste of retaining them, he is likely to retain them.

The farmers of the country come in for a hard "jolt" when the question of waste is under consideration. They are described as an outrageously wasteful lot, with no thought for their business future, working the poor land to a state of absolute depletion and then abandoning the farm and moving off to a place where they can find more new land to wear out. The people who make this assertion do not seem to realize that the farmers of the country are utilizing enormous quantities of soil food each year at a cost of approximately \$100,000,000 per annum and actually increasing their production per acre instead of further reducing it. The statistics of the Department of Agriculture show a larger average yield of wheat per acre the country over in 1909 than in any year since the sixties, the yield of oats per acre in 1908 larger than in any year since the sixties, and the average yield per acre of corn during the past five years much greater than the average of any preceding five years during the period covered by detailed statistical records.

A distinguished railroad magnate amuses himself by periodical outbursts about the depletion of the farms and farm production of the United States and predicts that the United States is soon to become an importer of food. Do the people who thus criticize the farmer for his wastefulness realize that the wheat and corn crops of 1909 were the largest (with a single exception) ever known in the United States, that the oat and barley crops of that year exceeded by far those of any earlier year? Do they know that these "wasteful" American farmers have, according to the Secretary of Agriculture, increased their wealth production from \$4,250,000,000 in 1897 to \$8,750,000,000 in 1909? Do they know that the population of this "wasteful" country of ours increased its wealth from \$30,000,000,000 dollars in 1870 and \$44,000,000,000 in 1880, to \$107,000,000,000 in 1904? Does this really look like "wastefulness?"

We hear many complaints about the destruction of our forests, and while there is, of course, too much truth in them, we must remember that the United States still has more of forests and lumber-producing area than any other country of the world except Russia; and when we hear complaints about the destructiveness of forest fires we must remember that forest fires occur in other parts of the world, perhaps with less frequency, but that the Forestry service of the government is exercising the greatest activity possible under existing appropriations and conditions to reduce destruction of the forests by fires.

And is there really the danger of a timber famine which so many people suppose? A member of the present congress, sitting at my desk a few weeks ago, said to me:

"This talk about the destruction of our timber and lumber materials is, it seems to me, based upon lack of understanding of conditions, existing and possible. I went into western Pennsylvania forty years ago as a very young man and established a sawmill. The prediction was then made that the timber supply for lumber purposes in that section would not last over ten years. The work of turning out lumber in that section has gone on uninterruptedly and yet the quantity now being turned out and the quantity of timber now available for lumber purposes is as great as forty years ago."

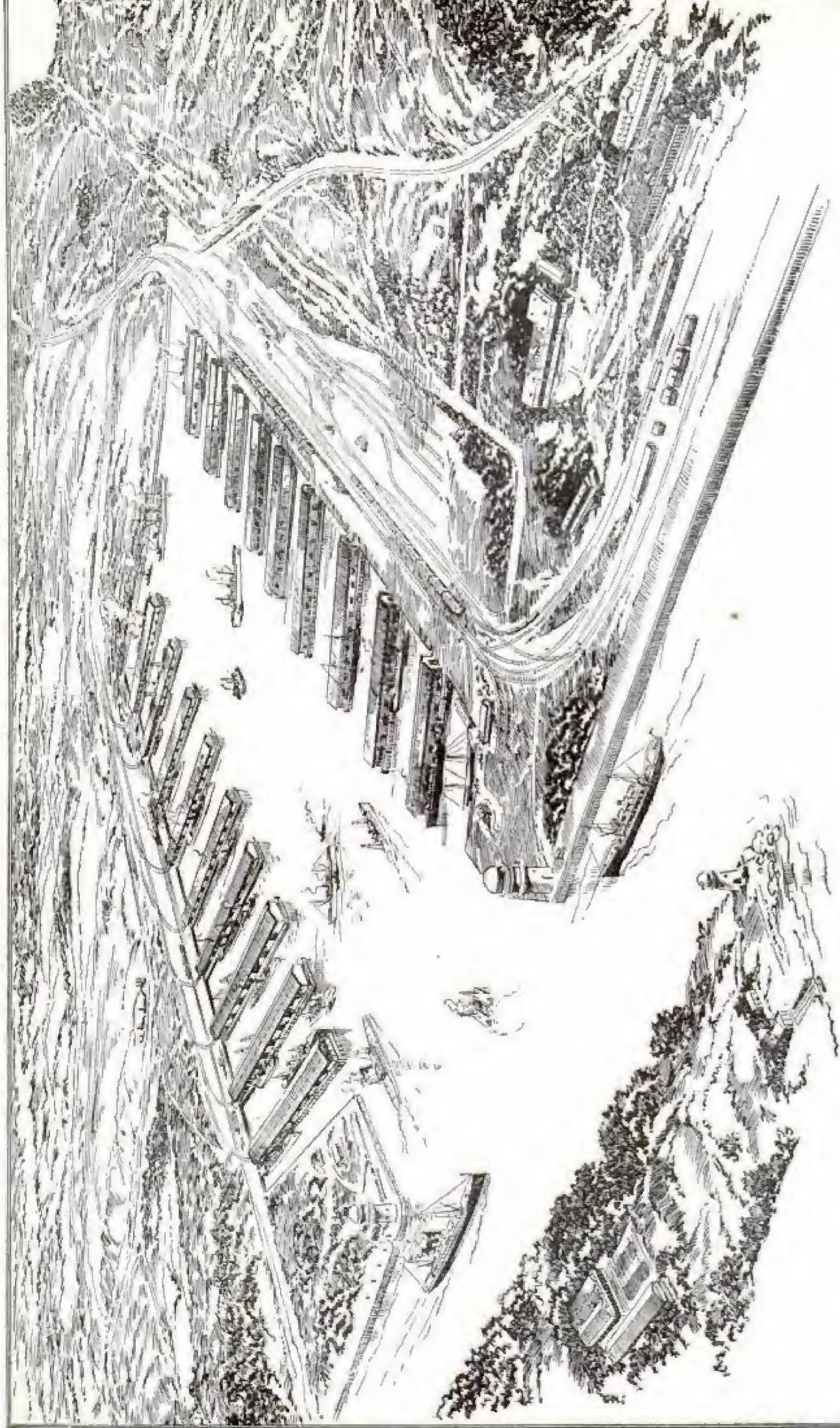
Of course we do not want to see our forests depleted for mere temporary

gain, but is it not worth considering that after using all we require for our own people, the people of other parts of the world have sent us during the last twenty-five years more than a \$1,000,000,000 worth of money for such surplus as we may choose to spare from our forest supply, the greatest of any country in the world except Russia?

Another subject of complaint frequently discussed, and one in which common humanity justifies a most careful consideration, is the waste of human life by accidents in coal mines, on railways and steamers and other public transportation facilities. True, the losses of life in this way are very great. But does not every firm or company or corporation engaged in mining or transportation realize that for every life lost through its own negligence toward its employes it must pay thousands of dollars in damages to the families of the deceased, and does it not seem probable, therefore, that a large percentage of the loss of life is due to carelessness on the part of others than the employers or to absolutely unforeseen accidents? True, the number of lives lost per 1,000 of people employed in our coal mines is much greater than in the mines of Europe, but it must be remembered that the European mines have been operated under different conditions and for a much greater length of time, and that there is already apparent a marked reduction in our own case as compared with a few years ago in the loss of life in our coal mines in proportion to the number of persons employed.

Still another subject of complaint is the waste of water—the fact that countless millions of gallons of water which falls from the clouds upon the soil in the interior of the continent are permitted to flow past certain comparatively arid areas straightway down to portions where it is not needed, instead of being impounded in those arid or semi-arid sections and used to irrigate the land and increase production. All this is true. But is not the United States already doing more and better and more intelligent work in this line—of increasing the producing power of its lands through irrigation—than any other country of the world? The sums expended on irrigation and reclamation during the last decade by the federal government amount to \$60,000,000 and by private individuals fully twice that amount, and will probably greatly exceed those sums during the next decade, a record which cannot be approached by that of any other country. Writers complain loudly about soil erosion, especially in the United States, due to the cutting away of the forests. But do they not know that the area formerly covered with forests became through their removal the garden spot of the world and so remains, and that the grain produced upon the area formerly occupied by forests has made this the richest country of the world and its people more prosperous than those of any country upon which the sun shines?

It is so easy to complain about other people's management. I know of no easier or more delightful occupation than that of managing other people's business at long distance and without responsibility for the results. But the people who have built up that business, who are responsible to themselves and their families and their stockholders and their stockholders' families, and to the public under the laws which govern and directly control their work, are much better able to judge whether this or that line of conduct or this or that failure to utilize a natural product is really a "waste," or whether the elimination of that waste by the necessary outlay therefor would or would not produce an equal or greater waste of the capital already accumulated, and for the conservation of which they are responsible.



SKETCH OF DOCKS AND HARBOR AT PANAMA, TO BE THE LARGEST IN THE WORLD. CANAL PROPER IN THE FOREGROUND

PANAMA TO HAVE LARGEST DOCKS IN THE WORLD

In contemplating the great engineering problem being solved in the construction of the Panama Canal, the people of the United States have almost forgotten that the plans for the big "ditch" also provide for the largest and most completely equipped harbor and dock system in the world, to be located at the Pacific end of the canal. A strip of land along the water front two miles in length has been reserved for the docks, and while but two-thirds of this will be immediately improved, the improvements thus provided for embrace construction work that will give the turning basin alone an area of 271 acres. There will be a series of piers on either side of the canal entrance, each of which will be 1,000 ft. long. The width of the canal between the pier ends will be 3,000 ft.

When it is remembered that the new Tilbury docks in London have a water area of only 70 acres, that the Hudson River at Hoboken is but 2,500 ft. wide, and that the longest docks in New York had to be lengthened, under temporary permit, to allow for the docking of the "Olympic," which is 860 ft. long, some idea of the immensity of the Panama dock plans may be gained.

The entire construction work is to be steel and concrete with foundations resting on bed rock, the material dredged from the harbor to be placed behind the docks and form an immense freight-transfer yard for the Panama railroad, which forms an integral part of the harbor plans. These yards will extend the full length of the docks and a spur of track will run out on each pier. The piers will be 1,000 ft. long and the slips between them will be 300 ft. wide. The length of the piers permit the docking at any one of them of two vessels 400 ft. long or three vessels 300 ft. long on either side or both sides at once. The width of the slips between the piers will permit a vessel to lie in the slip with steam barges on either side for the transshipment of freight.

Each of the piers will be fitted with the most approved appliances for loading and unloading, all the machinery to be operated by electricity. Huge electric overhead cranes, built so that they can command the top hatches of any vessel that can be accommodated—and this means the largest ships afloat,—and a system of escalators, or automatic loaders of the endless conveyor or chain type, will be installed for handling the cargoes. There will be enough of the cranes and the other appliances to serve every hatch of any ship that draws alongside the dock. It is believed by the engineers and steamship men who have planned the docks that their existence means a vast increase in the business of the canal. It now requires 21 days to carry a carload of freight across the continent by rail from the shipper in California to his agent in New York. With the use of 16-knot steamers from San Francisco to Panama and transshipping at Panama for New York, the freight schedule between the two cities can be reduced to 14 days. Similar reductions will be made in the freight service between North American and South American cities. Work was begun on the docks last November and it is the intention of the commission to have about one-half the work completed in time for the opening of the canal.

SUBMERGED ELECTRIC LIGHTS TO STOP EEL MIGRATION

The Danish government has undertaken to prevent the migration of eels from a portion of the Baltic Sea into the outer ocean, by means of a barrier of electric light. Fifty electric lamps are to be placed along a submerged cable between the island of Fanö and the coast of Fyen. The eels migrate only during the dark hours, and it is believed this wall of light will keep them from passing.

HORSE HAS GOLD TOOTH

"Black Bess," the British horse who plays the leading part in the production



The Tooth Broken by This Horse was Replaced by a Gold Crown

of "Dick Turpin's ride to York," recently broke a tooth. A dentist was called in from his office on the Strand and built a gold crown to replace the broken tooth.

CONVERTIBLE CAR FOR ELECTRIC ROADS

A type of electric car that can be used either for freight or passengers has been put into service by the Hummelstown & Campbelltown Electric



An Electric Car Which may be Used for Either Freight or Passengers, the Seats Folding against the Walls When It is to be Used for Freight

Railway, Pennsylvania. Used as a passenger car, the seating capacity is 48, the seating accommodation consisting of continuous folding benches along both sides. Even the space in front of the sliding freight doors can be utilized for seating passengers, folding seats being hinged to the doors. These, when folded, slide with the doors into the door pockets. When the car is used for freight, the other benches fold against the walls.

A ROTARY-SLEEVE-VALVE AUTOMOBILE MOTOR

There has recently been placed on the market in France a new "valveless," single-cylinder, automobile motor which possesses features similar to those of the Knight engine and of the so-called "cylinder-valve" (rotary-cylinder) motor that attracted attention a few months ago. This engine has a continuously rotating sleeve, with ports or openings (for inlet and exhaust) located approximately at 90 deg. one from the other, in place of the more usual lift or poppet valves. The sleeve fits between the piston and the cylinder walls and is fitted with a deep compression ring to allow for expansion or contraction due to changes of temperature and so prevent leakage of the gases. It is driven at half the engine speed by helical or inclined-tooth gearing through a small countershaft which is rotated by a silent chain drive from the engine crankshaft. The motor is said to be admirably suited for small cars, and the automobile which has been especially designed for it has many new and interesting features.

When King George V goes to India for the Durbar he will live in a tent. Thousands of the visitors to India to attend the pageant will also live in tents, the British government taking this means to counteract the exorbitant charges that are being already made for houses in the vicinity of Delhi during December.



Coasting down a Curved Incline in Germany on Three-Wheeled Summer Toboggans

THREE-WHEELED SUMMER TOBOGGANS

A three-wheeled coaster, called a summer toboggan, is coming into general use in Germany for coasting down inclines. The seat is arranged above the single rear wheel, and steering is

done by means of both the hands and feet. The little coaster is quite light, and at the end of a descent can be collapsed and slung over the back for the return trip up hill.

LONG-DISTANCE HEARING APPARATUS

Differing from the various kinds of earphones which are used to aid persons of defective hearing, a new long-distance hearing apparatus has recently been invented to assist the hearing of normal persons in much the same way that a telescope does the eye; that is, it enables one to distinguish sounds through a greater distance, besides amplifying those which would ordinarily be detected by the unaided ears. For this reason it has been facetiously called the "ear telescope."

Really, it is a sound-concentrating device, and gives a person the same advantage as if he had ears larger than those of a donkey. A reflector catches

a greater volume of sound waves than would be intercepted by the ear. These waves are concentrated to a



The "Ear Telescope" Which Enables the Ear to Detect Otherwise Inaudible Sounds Proceeding from Great Distances

focus, and then directed through flexible tubes to earpieces. Thus a person is enabled to obtain about 12 times the volume of sound at his ear drums that he would with his own ears unaided by the apparatus.

The reflector or sound receiver is mounted on a swiveling contrivance by which it can be turned in any desired direction. Naturally the sound heard by the operator will be greatest when the reflector is directed toward the source of the sound. And this fact has suggested as one of its principal uses the location of ships in fogs, for the direction from which the sound of a fog horn or fog bell is proceeding would immediately be made apparent by means of the "ear telescope."

GIANT STONE ARROW TO GUIDE FLYERS

A giant white stone arrow has been constructed on the cliffs above Dover as a guide to airmen flying by day from England to France. It points



Giant Arrow of White Stone Constructed on the Cliffs above Dover, Eng., to Guide Airmen

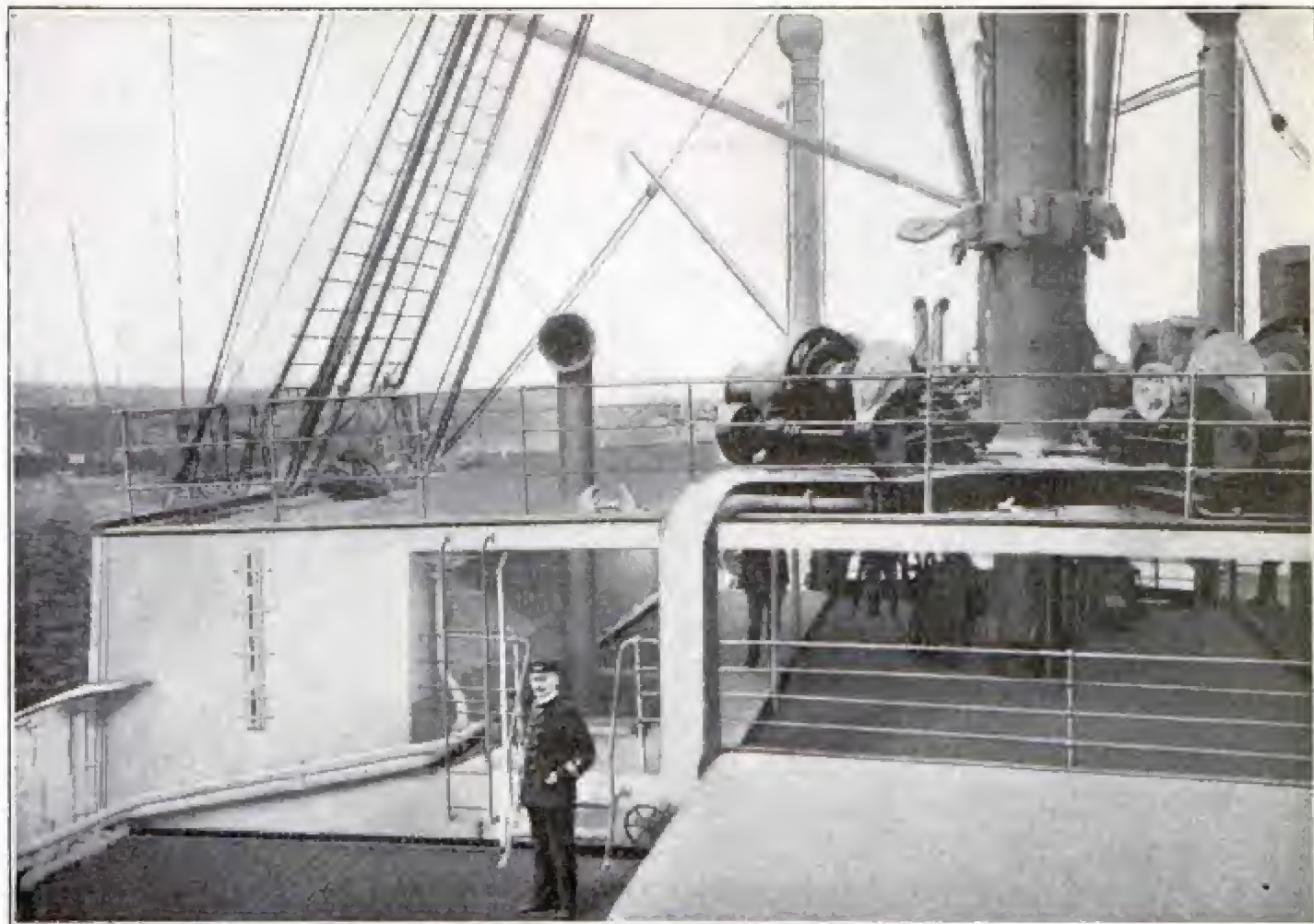
the exact direction they should take to reach Calais. It is proposed to construct a number of similar arrows at different points along the coast.

HARDTACK LOSES PLACE IN SOLDIERS' DIET

The American warrior of the future will not be able to build romances or excite the sympathy of the home folks with his tales of hardtack. Hardtack is about to pass into the great beyond with the other things that have been forgotten by a progressive people. Field bread will take its place except as an emergency ration. Quietly, but none the less diligently, at the big Texas maneuver camp, scores of new things have been tested, numberless theories have been tried out and conclusions reached that may work a revolution in the conduct of military affairs. In the subsistence department there have been numberless innovations resulting from the experience gained by the commissary officers. The development of a new form of bread to take the place of hardtack in the field under all but extraordinary circumstances, has been but one of these.

Field bread is like the fresh bread that has always been made for the troops except that it is of a finer, porous structure and is covered with a thicker crust. Exhaustive tests have shown that it keeps fresh for a week or ten days. Some of the troops to whom it has been issued prefer it to fresh bread and it has been conclusively demonstrated that it can be served to troops in the field under practically all conditions to be found during a war. Hardtack will still have a place as a part of the ration, but it will not have so extended a field of usefulness as heretofore.

¶The aluminum radiator constructed in Dresden for the 300-hp. engine of an airship, is claimed to be the largest in the world. The weight is 145 lb. empty, and 209 lb. when filled with water.



On the Left Is One of the Anti-Rolling Tanks of the "Ypiranga" Which Converted an Unsteady Vessel into One of the Steadiest Ships Afloat. Height of Water in Tank Can Be Seen by Gauge

ANTI-ROLLING TANK OF 12,600-TON LINER

The illustration shows one of the anti-rolling tanks of the Hamburg-American liner "Ypiranga," a 12,600-ton boat which, in spite of her bilge keels, was formerly notorious for her unsteadiness at sea. There are two of these tanks, placed respectively near the fore and the after masts on the upper deck, and connected by a flying bridge. The tanks are replenished by the deck-washing pump, and the action of the water in the tanks, when the ship is rolling, may be controlled by regulating the movement of the air in the side branches by means of an air lock situated between the upper ends of the side branches.

Since the installation of these tanks the "Ypiranga" has become one of the steadiest ships afloat, the pendulous action of the water in the tanks seeming to compensate the wave action which causes rolling. A sister vessel, the "Corcovada," has been similarly

fitted, and the same construction has been or will be applied to many other big ships, in passenger vessels to prevent seasickness and in warships to steady them for gun fire.

"WIRELESS" LIGHTHOUSES

The French government has decided to install wireless sending apparatus on two lighthouses near Cape Finis-terre and on a lightboat, stationed near the mouth of the Seine River, for the protection of vessels during fogs. These "wireless lighthouses" will each emit a characteristic signal, conveying no special meaning, but calculated to be easily "heard" and intended only to enable vessels to locate, by means of the Bellini-Tosi radio-compass, the direction of these lighthouses relative to the ship, and to set their course accordingly.

LINCOLN MONUMENT IN SCOTLAND

The first statue of Abraham Lincoln erected in Europe is in the Calton cemetery at Edinburgh, Scotland. It was raised to perpetuate the memory of the Scottish-American soldiers who were



Lincoln Monument at Edinburgh, Erected in Memory of the Scottish-American Soldiers of the Civil War

killed in the Civil war. The statue of Lincoln, mounted on the top of the pedestal, is a life-size bronze cast, and the figure on one of the ledges of the pedestal is a freed slave poised as if to greet his liberator.

A SIMPLE SPEED GAUGE FOR AEROPLANES

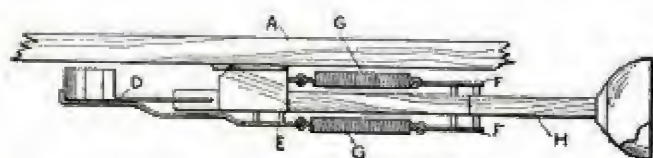
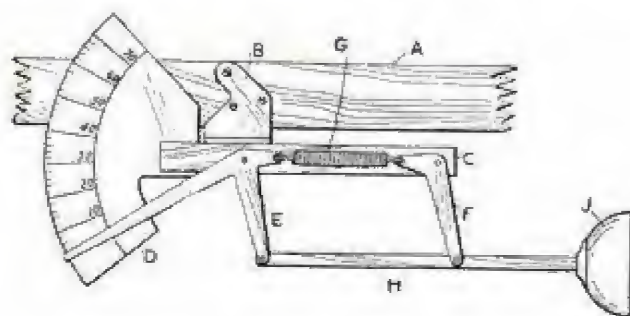
It is important for an airman to know the speed at which his machine is traveling through the air, and although any device for measuring speed which depends on the forward pressure of planes against air may be extremely deceptive owing to the varying head resistance of winds, such an instrument is of great value when

gliding down from a great height where a mistake in estimating the speed may result in disaster.

Ogilvie, the English airman, used a simple speedometer on his baby Wright biplane during the recent Gordon Bennett race. It was constructed from a design originally made by Sir Hiram S. Maxim. The gauge is simple and yet all the parts are in balance.

The part marked A in the illustrations represents a spar on the aeroplane, which by means of a bracket B, supports a horizontally arranged bar C. The scale D is inserted in a slot in C, and two pairs of levers, E and F, both pivoted to the bar C, are kept in their normal positions by two springs G, one on either side of the bar C. The lower ends of the levers E and F support a horizontal stick H, which carries a semi-spherical cup J at its front end. This cup is made of celluloid; in fact, it was made from one-half of a baby's rattle.

It will be readily seen that when the aeroplane travels forward the open side of the cup J receives the force of the wind, and pushes back the stick H, thus turning the levers E and F on their fulcrums, and extending the springs G, and as the springs are attached to portions of the levers E and F, which move in opposite directions and increase in angular movement with the continued movement of the stick H, the resistance to the move-



Side and Top View of Simple Speed Gauge, Made by an English Airman

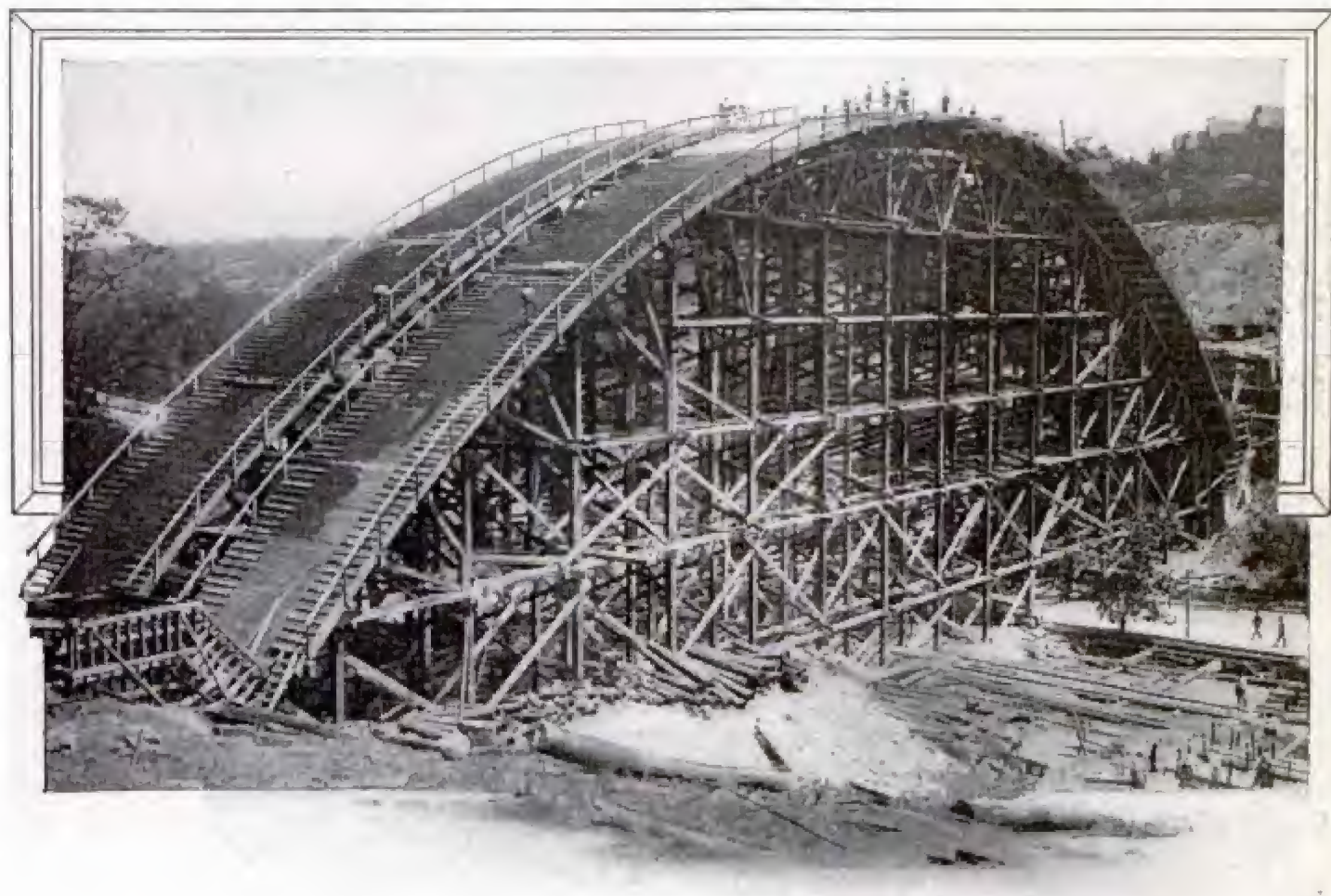
ment of the lever E is proportionately increased, so as to enable the indicating finger to travel over the scale with a movement approximately proportional to the speed of the machine through the air.

A HUGE FALSEWORK STRUCTURE

The picture below shows the timber falsework for what is to be the widest concrete span in the world, although

it lacks 12 ft. of breaking the world's record for length. The bridge will connect Larimer avenue, Pittsburg, Pa., and it takes the place of the antiquated trestle which formerly occupied the site.

The structure will cost the city about \$150,000, and its design is considered an artistic as well as an engineering triumph. It has a total length of 650 ft. It will support a roadway 50 ft. in width and will be ready for foot traffic by December. The concrete work is of the reinforced type.



Remarkable Falsework in Construction of Pittsburg Concrete Arch Bridge

A CHEMICAL RHAPSODY

O come where the cyanides silently
flow,
Where the carbonates droop o'er the
oxides below,
Where the rays of potassium lie white
on the hill
And the song of the silicate never is
still.
Come, O come, tum titti tum,
Peroxide of soda and uranium.

While alcohol's liquid at thirty de-
grees
And no chemical change can affect
manganese,
While alkalies flourish and acids are
free
My heart shall be constant, sweet Sci-
ence, to thee.
Yes, to thee, fiddle-de-dee.
Sulphate of iron and H O plus C.



DUCK-SHOOTING GUNBOAT

If the combination shown in the accompanying illustration were designed for the shooting of human beings instead of ducks, it would come under the head of warships. It is a duck-shooting motorboat of shallow draft, provided with a long gun, which swings to any angle on its

FIRST MOVING PICTURE

Probably the man that can claim the greatest credit for moving pictures is Edward Muybridge of Oakland, Cal., who, at the instigation of Governor Leland Stanford of California, made countless pictures of the governor's celebrated trotter Occident, the first horse to trot a mile in 2 min. 20 sec. west of the Rocky Mountains. Occident was the pride of the governor's heart and he engaged Muybridge to photograph him in every conceivable size and shape. In making a series of snapshots of the horse's action, Muybridge was enabled to show the exact motion. In order to satisfy the governor, he thought of a novel scheme of placing a number of cameras covering at least one-tenth of a mile. From these cameras, he stretched silk threads across the track at about the height of the trotter's knee. These threads being broken, each camera made a separate, distinct picture of the horse, and by putting them together and riffling from the thumb, the horse could be seen as in actual motion. In 1885 Muybridge sailed for England, and there, in connection with six or seven others, evolved the first moving-picture camera. In about 1886 some of these cameras reached America. In 1887 the patent offices at Washington commenced to receive a shower of applications for moving-picture apparatus both for taking and projecting purposes.

FOUR DRILL HOLES BORED IN RESCUE OF MINER

Four 6-in. drill holes had to be bored before the workers attempting to rescue Joseph Clary, a miner, from his entombment in the White Oaks mine, Joplin, Mo., succeeded in establishing communication with him. Imprisoned 78 ft. below the surface by a cave-in, he faced several forms of death, including death by starvation, and death by drowning in the slowly rising water. When the rescuers had at last reached



Diagrammatic Drawing Showing How Miner was Saved by Drilling a Hole through Which Food was Lowered to Him

him he had retreated to the highest point in the drift and the water was above his waist in many parts.

Communication and a food supply was established long before the rescue

shaft penetrated the drift. The first food sent to him through the 6-in. drill hole which opened communication with him was in liquid form. This was followed a few hours later with a light lunch, and the cold chicken he had been demanding was promised for several hours later. He was entombed 72 hours.

NEW AVIATION RECORDS AND DEATHS

Three new marks set and four lives lost are recorded in the history of aviation in the past few weeks. The new records made have all been along the line of practical development. Harry N. Atwood flew from St. Louis, Mo. to New York, a distance of 1,265 miles in 28 hours and 31 min. of actual flying time, making 20 separate flights. The total distance covered was 1,365 miles. Atwood started from St. Louis, August 14, at 8 o'clock in the morning and flew to Chicago on the first day, a distance of 286 miles. An international aviation meet was in progress at Chicago and the transcontinental airman's arrival and departure for the east the next day were made features of the meet program. After various vicissitudes Atwood arrived in New York and alighted on Governor's Island, August 24,

beating the former world's record held by Herr Koenig, a German, by 101 miles.

The Chicago air meet extended over ten days, and was notable for two world's records and two lives lost. G. W. Beatty remained in the air 3 hr. 22 min. with a passenger. The day before he had broken another record by remaining in the air 1 hr. 18 min. 22 sec. with two passengers. William R. Badger and St. Croix Johnstone were the airmen who lost their lives, their deaths following one another on the afternoon of August 15. Badger fell 50 ft. from a Baldwin biplane at the end of a vol plane. Johnstone's Moisant-Bleriot monoplane fell into Lake Michigan from a height of 600 ft.

The other deaths occurred in Europe and both victims were military officers. Lieutenant T. J. Ridge of the British army fell at Aldershot, Eng., August 18, while trying out for the first time a new type of military machine. On August 29, Lieutenant Zelotnehin of the Russian army fell at St. Petersburg and was killed.

According to a report from Coalinga, Cal., two men recently made descents to a depth of 185 ft. in a hole only 18 in. in diameter to recover drill tools which had been lost.



Route Followed by Atwood, Showing His Flight from St. Louis to New York

VANIMAN'S ATTEMPT TO CROSS THE ATLANTIC

By J. Q. ROBERTS

STILL strong in his faith in the dirigible balloon and the possibility of crossing the Atlantic in a properly constructed lighter-than-air craft, Melvin Vaniman, chief engineer of the "America," which made a brave attempt to accomplish the feat a year ago, is now assembling a larger airship at Atlantic City, expecting to start for Europe by the air route some time in October. He believes that by applying the knowledge gained from the experiences of the "America," and a new means of compensating for the added lifting power of the gas when exposed to the heat of the sun, he will be able to make his way through the storms of the Atlantic and the uncertainties of the air lanes.

Just what this new means of compensating consists of has not been made public. The famous "equilibrator" of last year's airship will be missing. Two methods have been discussed by Vaniman and his assistants and advisers, but these may be discarded at the last moment and another method adopted. One was to pump water into tanks in the airship by means of a long hose; the other to pull up water in a string of buckets something like the plan adopted by Brucker, the German-American who planned to attempt to cross the Atlantic in the "Suchard," a large dirigible. Up to September 1st, however, the plans of the builders in this connection were withheld. At that time Vaniman stated:

"I am not at liberty to disclose this method. There will be no equilibrator, however. This phase of the airship is being kept secret as it now seems to be the only problem which has not been solved. There are no water buckets and no special tanks for water in the airship."

As a result of the experience last year, when the absence of a flywheel on the after engine put it out of commission and deprived the aeronauts of

the lifting thrust of the after propellers, close attention has been paid to this feature of the "Akron," as the new craft will be christened. There will be four engines, two of 100 hp. each, one of 80 hp., and one of 18 hp., the first three for the three sets of propellers, and the latter for lifting purposes and for running the dynamo which will furnish electricity for the wireless apparatus. Two of these engines will be of American manufacture and two of foreign make. At least one pair of propellers will be mounted so that the thrust can be secured in any direction.

In almost every detail of the "Akron" there will be improvements suggested by the experiences of the Wellman expedition. One of the most important changes will be in the manner of suspending the motor lifeboat under the inclosed frame. Last year the boat was almost swamped when it was launched, owing to the fact that the airship, in descending to the water, came down with a side movement, launching the little boat broadside. This was due to the method of suspending the lifeboat by the ends. This year it will be suspended by a single fall and tackle, enabling the crew to launch the boat bow on in spite of any broadside movement of the balloon.

The position of the vertical rudder will be the same. The principal horizontal rudders, governing the ascent and descent, will consist of a pair of triplanes attached to the frame well toward the bow. There will be three auxiliary horizontal rudders at the rear.

Filled with hydrogen gas, the balloon will have a gross lifting power of 26,000 lb. The bag is built of a strong fabric composed of layers of cotton and rubber cemented together. The upper two-thirds of the envelope is made of four layers of rubber and three of cotton. This fabric has a tensile strength of 175 lb. per sq. in. As the



The Enormous Box in Which the Balloon Fabric was Shipped to Atlantic City—Section of Building Wall was Removed to Get the Box Out

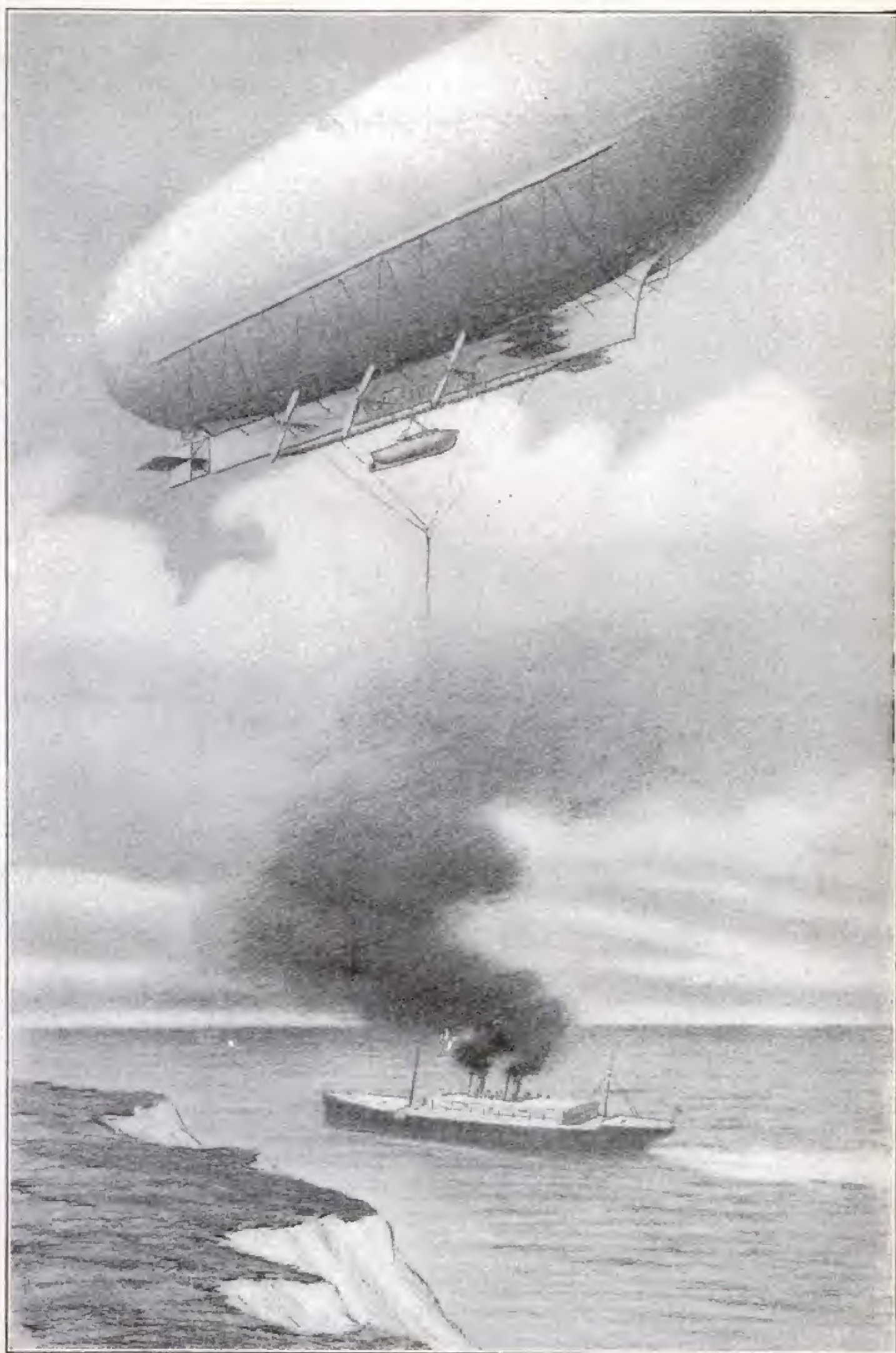
under side of the bag will have only the strain of the internal pressure to withstand, this part will consist of only two layers of cotton and three of rubber. The frame, which is built of steel tubing, will be attached to the envelope by loops sewed onto the side of the bag. Long, light rods will be run

through them, and the framework suspended from these rods. The balloon fabric is bright yellow to prevent deterioration by the ultraviolet rays of the sun.

One of the features of the "Akron" will be two balonets, located in the lower part of the gas bag. To com-



The Balloon Fabric, the Largest Ever Made in the United States, Stretched Out on Floor of Factory



THE "AKRON," DIRIGIBLE DESIGNED BY MELVIN VANIMAN, WHICH WILL ATTEMPT TO CROSS THE ATLANTIC

pensate for any leakage, and to maintain an even pressure in the bag, when the gas is expanded by the heat of the sun or contracted by cold, these balonets can be filled with air or emptied at will. The hydrogen with which the bag will be filled at Atlantic City must carry it on its entire journey. The envelope will be cigar-shaped as usual, with the extreme diameter, 45 ft., about one-fourth way back from the forward end.

The framework, with the engines, fuel tank and cabin, weighs about 14,000 lb. When the start is made,

about 8,000 lb. of gasoline will be stored in a large cylindrical tank beneath the framework. This tank will be divided into compartments to prevent disturbance of the equilibrium by shifting of the weight. The wireless outfit will be located in the lifeboat. The crew will consist of six men. Five have been chosen; one Frenchman, one Dane, one Englishman, and two Americans. The capital for constructing the dirigible, which will cost about \$150,000, was furnished by F. A. Seiberling, a rubber manufacturer of Akron, O.

THE MILLIONTH PATENT

The millionth patent has been issued!

It seems difficult to realize that in 121 years the government of the United States has given its protection to the devices of inventors more than a million inventions have been recorded as practicable, and their fortunate owners permitted to enjoy the exclusive right to make or sell them, or say how they should be made or sold. The millionth patent marks an epoch in the history of invention, although it is not strictly accurate in recording the number of patents that have been issued since 1790, when this branch of the government started business. There was a long time when business was very dull, and but one clerk, working only part of his time on this particular part of his duties, was able to handle every application made. There had been 9,957 patents issued before the present system of numbering was inaugurated.

It therefore appears that some 1,009,957 patents have really been issued in 121 years—an average of about 8,349 per year or 22 a day. These figures, too, are misleading, because the fact is that during the early years of the republic's history only 9,957 patents were issued. Then the numbering of them commenced. In 1891, when

the hundredth anniversary of the patent office was celebrated, there had been 450,000 patents issued since 1836. So that in the last 20 years there have been more patents issued than in the entire century preceeding them. That is to say, that of the 1,000,000 patents issued some 550,000 have been granted in 20 years. It would be interesting to know just how many of them have brought their inventors the riches they dreamed of getting. Some of the wealthiest men in the country have gained their wealth through the medium of a patent owned by them, and some of the biggest monopolies in the world owe their security from competition to the protection the government has given them. But this is not always the result. Inventors are usually pictured as poor men who have a difficult time placing the creatures of their brain and hands on the market. It is a fact that while many feel called to revolutionize the industries or arts of the country, few are chosen to enjoy the fruits of their work.

It so happens that the process protected by the first patent ever granted by the government has never been improved. This patent was issued to Samuel Hopkins of Vermont, July 31, 1790, and protected a method of making pearlash, or potash, when vege-

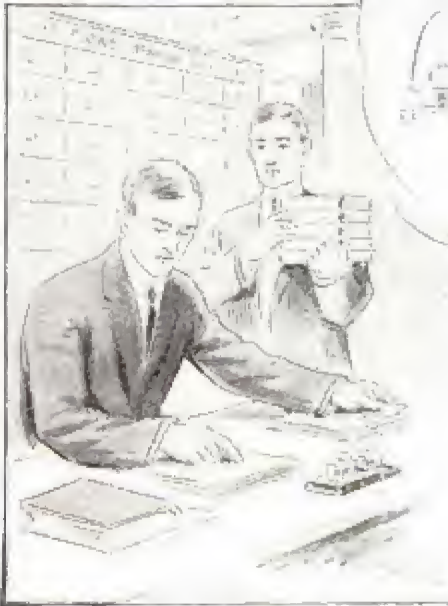
The Completed Model
of Machine



Reducing the Idea to Form



Consulting a Patent Attorney



Through the Patent Office



Birth of the Inventive Idea



Receives Letters Patent



Attempting to Organize
Company



FAILURE—His Patent Has No
Place in the World



SUCCESS—His Found a Market
and Wealth

THE COURSE THROUGH WHICH A MILLION PATENTS HAVE PASSED—
FAILURE OR SUCCESS AWAITS THE INVENTOR

table matter is refined in a crucible. The patent bearing No. 1 on the files of the patent office covered a steam engine designed to run on an inclined plane, and was issued to John Ruggles,

July 28, 1836. The "millionth patent" was issued August 8, 1911, to Francis H. Holt of Akron, Ohio, and covered an invention for a puncture-proof pneumatic tire.

HYDRO-AEROPLANE PROGRESS

Commencing rather more than a year ago, the first successful experiments with aeroplanes designed to start from

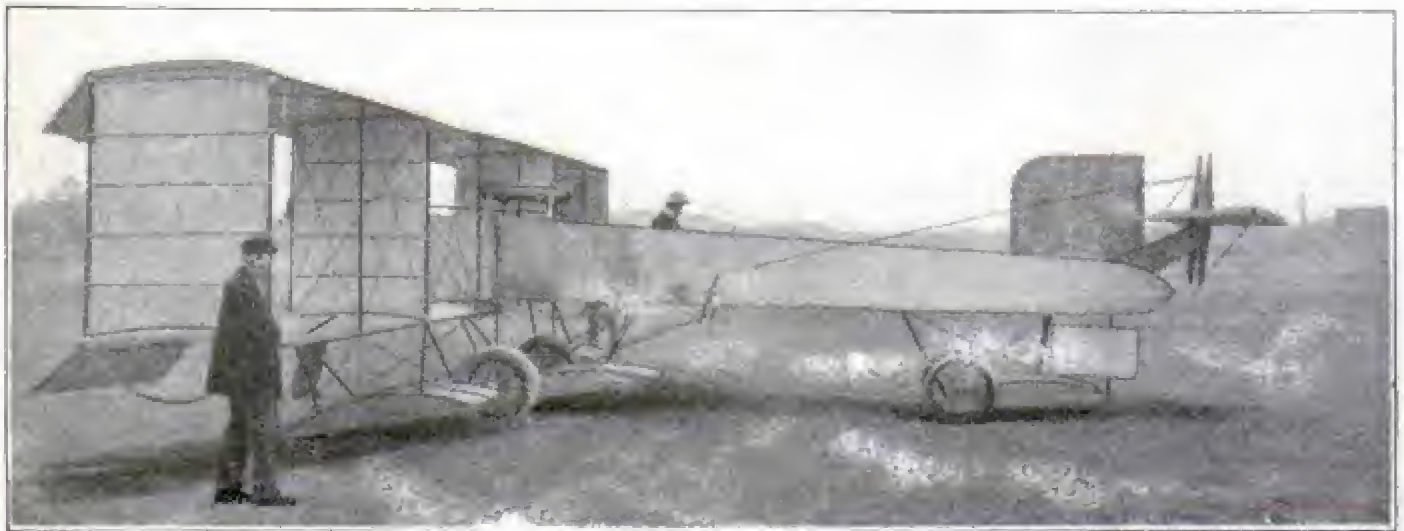
headquarters in the city of Marseilles. In its final form, Fabre's design evolved to a monoplane with a front elevator, borne upon three hydroplane floats, closely resembling the hydroplane hulls that are so recent and novel a feature of high-speed motorboat development. One of the floats was placed beneath the elevator and the other two toward the extremities of the main planes, so that the arrangement afforded a three-point support of the whole machine upon the water. Handicapped by the use of an aeroplane that had not been previously developed as a flyer, frequent minor mishaps attended the trials, but ultimately numerous flights were made at good speed, starting from and alighting upon the water with the utmost ease and without accidents.

Following the Fabre experiments, Glenn Curtiss commenced in the United States his work of improving the hydro-aeroplane or aero-hydroplane, with which he has been highly successful. Especial credit is due to Curtiss for his combination of the hydroplane with land-alighting gear,



The Machine Built for the English Government

and alight upon water surfaces, were carried out by the French engineer Fabre, of the famous steamship-line firm of the same name, which has its



Voisin's New "Canard" ("Duck")—Note Small Vertical Water Rudder over Float in Front



One of Glenn Curtiss' New Hydro-Aeroplanes on Lake near Hammondsport, N. Y.



It Moves with Great Speed on the Water, Outstripping Fast Motorboats

The Possibilities of this Machine as a Life-Saver were Demonstrated during the Recent Chicago Meet when it Offered Assistance to Airman who Fell into Water, but Preferred to Remain with His Floating Aeroplane, as Depicted on the Front Cover of This Issue

so that his machines can be brought down upon or started from either land or water.

The Curtiss system now involves only one pontoon-like float at the center of the machine, provided with a characteristic hydroplane underform. Cylindrical floats at the wing tips prevent their submersion if the machine tilts on the water, but perform no normal function in landing or starting. A small "splash plate" is placed just above the water in front of the main float, to give the initial elevation for starting by striking the bow wave pushed along by the float.

Other experimenters at work upon the hydro-aeroplane problem are the Voisins, in France, and A. V. Roe, in England. One of the Voisin "Canard" machines with four floats has thus been flown from the Seine very successfully by the well-known airman, Colliex. This machine has a water rudder attached to the forward float. The Roe experiments have been for the British navy, and the machine is a new Roe biplane with twin floats under the main planes. Indifferent success has been attained so far, due apparently to lack of proper balance rather than to any more inherent difficulty.

BRITISH SAILORS PRACTICE WITH DUMMY AEROPLANE

The man-o'-war's men stationed at Barrow to man the British navy's airship are as interested in the heavier-

is a skeleton framework representing an aeroplane and is balanced on a pivot. A fresh breeze sets it rocking and swinging, the motion being counteracted by the planes. The bluejackets learn by practice to keep the machine fairly steady in spite of the wind.



Courtesy Illus. London News
British Bluejackets Practicing Aeroplaning with a Specially Constructed Stationary Machine

than-air type of flying machines as in the dirigibles. Several of the bluejackets recently purchased for themselves a machine specially designed for the instruction of airmen. It

ENGLAND MENACED BY FAMINE

England's last great sensation, coming on the heels of the coronation and the stripping of the veto power from the House of Lords, was the threatened paralyzation of the business of the empire resulting from a general strike that for a short time portended most serious results and created a grave situation.

The strike started with the men who work on the docks refusing to load and unload ships. When means were used to employ outside help the carters promptly refused to haul goods thus unloaded from the ships and their refusal was quickly followed by the walking out of the railroad employes. The result of this series of walk-outs was that so far as the haulage of goods was concerned, practically all lines of transportation were tied up,

trains and ships being run only as make-shift crews and stevedores could be obtained. The schedules of some of the big liners were suspended altogether. There being practically no freight hauled by the various shipping interests and practically no carting in the cities, the supplies of the shops were quickly exhausted and a food shortage occurred.

While the strike was accompanied by more or less disorder and troops and police were frequently called into action, there was comparatively little violence, practically none of which was blamed on the strikers themselves. The question of wages was the main issue with the dockmen and carters, but this was not the case with the railway men.

The strikers have all returned to work and a commission has been appointed to inquire into the causes and consider a means of preventing such outbreaks in the future.

One of the features of the situation was the discussion among scientists of the effect of the extreme hot weather on the labor situation. Medical men insist that the spirit of unrest and revolt was largely due to the extended period of heat and sunshine which prevailed in England to an unusual extent for several weeks. Analogy was made to the effect on the white man



Courtesy "The Graphic"

Luxurious Touring Cars Used for Hauling Meat through London during the Progress of the Strike

of the tropical sun in Africa under weather conditions to which he was not accustomed. It was a common remark in London that a good sousing by a three days' rain would settle the whole thing.

TWO 'ROUND-THE-WORLD RECORDS

André Jaeger-Schmidt, a French journalist, completed a record-breaking trip around the world on Aug. 26, his time being 39 days 19 hours 43 min. 37 sec. A telegraphic dispatch sent, as a commercial message, around the world by a New York newspaper, made the circuit in 16 minutes and 30 seconds. No arrangements for this message were made in advance.



A curious type of air craft, known as the Rommé-McCormick aeroplane, a circular monoplane with a bamboo structure, resembling a giant Japanese umbrella. It has been undergoing tests at the army camp at San Antonio, Texas. It is 40 ft. in diameter and is equipped with a Gnome rotary motor



The Reaper Hook or Knife, Most Primitive of Harvester Implements



The Flail, the Original Thresher for Beating Grain from the Straw



The Scythe with a Cradle. The First Real Improvement over the Reaper Hook



The First Horse-Drawn Reaper, Which Simply Cut the Grain

THE WONDERFUL PROGRESS OF HARVESTING IMPLEMENTS DEMON

FORTY CENTURIES



The Original Binder Which Required Two Men to Tie the Bundles of Grain



A Battery of Modern Machines that Both Reap and Bind Drawn by a Traction Engine



The Highest Development of Agricultural Machinery—the Traction Reaper-Threshing Machine Which Takes the Grain from the Ground and Threshes It, Getting Both Locomotion and Power from a Gasoline Engine

WASHINGTON HAS WORLD'S CHAMPION FLY SWATTER

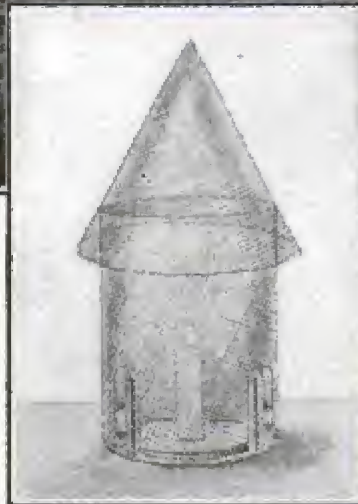


Counting One Day's "Catch" in

Seven million flies killed in less than two weeks is the record made by the children of Washington, D. C., in a remarkable campaign conducted there under the auspices of the health department.

Spurred on by the hope of winning cash prizes offered by a newspaper, the keenest rivalry developed among the hundreds of young campaigners. When the battle ended, the leader, a 13-year-old boy had 383,400 dead flies to his credit.

The health department and the newspaper which gave the prizes have had dozens of inquiries about the campaign from cities all over the country. A public spirited citizen furnished, free of charge, boxes in which the "catches" of the contestants were delivered to the officials who measured and counted them, the Associated Charities received the dead flies daily at their stations in various parts of the city, and a transfer company collected the boxes



Fly Trap That Proved Its Efficiency

Washington Fly-Swatting Contest

and delivered them to the health department.

It was ascertained that so many flies of average size made a gill and the score was kept on this basis. The officials were provided with graduated gill measures made of glass, and each day's catches of flies were measured. The daily record of each contestant was kept on a card together with his name and address and the section of the city where he caught the flies. This information has been carefully preserved by the department and will be used in a systematic and tireless effort to eradicate the breeding places of the disease carriers, many of which had escaped the attention of the inspectors.

Layton Burdette, the winner of the first prize, set out to distance his competitors by organizing his friends into a fly-swatting brigade. These boys divided their section of the city into beats and enlisted the aid of store-

keepers and marketmen in their neighborhood. Burdette made his own traps but his main dependence was on the ordinary swatter made of wire. His traps were constructed of screen wire, cylindrical in shape with a dome which was detachable. The bait was placed at the bottom, which had several small openings, a dark cloth drawn around the lower portion of the

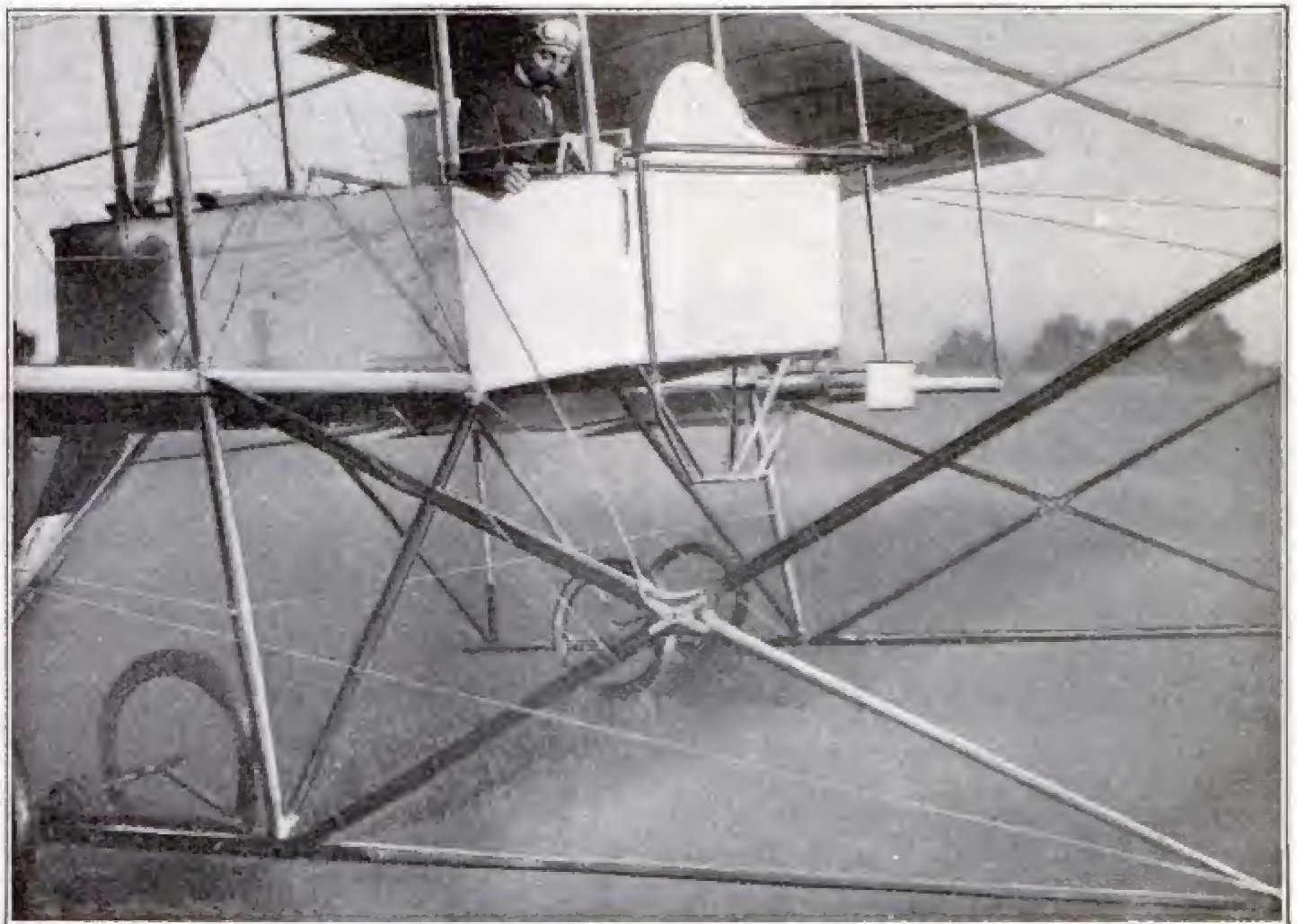
trap, and the dome left uncovered. After feeding, the flies sought the lighted dome and this was removed at intervals and the flies killed by sulphur fumes. Health Officer Woodward is of the opinion that the value of the flyless-city campaign cannot be overestimated. He sees no excuse for the fly and says it can be driven out of existence by determination and patience.

AUTOMATIC AEROPLANE STABILIZER

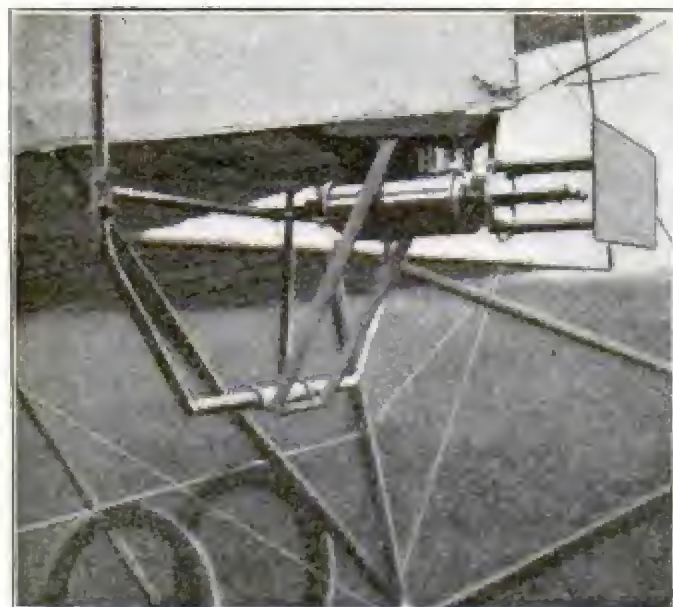
One of the first serious attempts to place into practical use an automatic stabilizing device for aeroplanes, is in progress under the auspices of French army officials.

The new device is the Doutre "stabilizer," and is intended to effect automatic control of only the longitudinal equilibrium of the machine. Its essential elements comprise a movable pressure plate interconnected with a

compressed-air device for manipulating the elevator surface. Various delicately balanced details are involved, so that if the speed becomes excessive, as in too abrupt a descent, the elevator is set to ascend. Conversely, if the machine slows to a point rendering the sustentation insecure, the elevator is manipulated to steer down. Rather clever utilizations of the forces of momentum and inertia, applied through

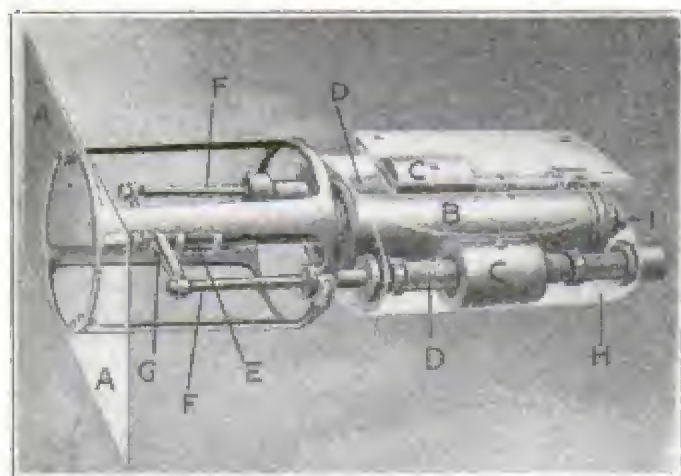


The Doutre Stabilizer Installed on a Maurice Farman Biplane



How the Stabilizing Device is Attached to the Front of the Machine

the means of sliding weights, are claimed to make the action of the device in exact quantitative proportion to the upsetting moments on the machine, but engineers who have had experience with aeroplanes in the air are tending to grow more and more skeptical of all automatic devices of this character, and to rely more and more upon the undoubted feasibility of so designing machines that they are inherently stable by virtue of the arrangement and interaction of their sustaining, fin, and rudder surfaces, rather than through the, at best, precarious juggling of automatic balancing devices.



Phantom View of the Stabilizer—A, Windplate; B, Compressed Air Cylinder; C, Movable Weights; D, Springs Controlling Movable Weights; E, Piston Rod into Compressed-Air Chamber; F, Fixed Sliding Rods; G, Cross-Arm Connecting Them; H, Spring Controlling the Windplate; I, Point of Attachment to System of Levers.

Aeroplane models and full-size machines can be and have been built, that

will, without action on the part of the operator, turn right-side up, even when dropped upside-down. Development of the principles that determine such action is, in the opinion of those best qualified to judge, the road to the highest possible safety in the air, and is one it will best pay experimenters to travel.

TRANSPORTING HORSES BY AUTO TRUCKS

A curious and interesting demonstration of the superiority of auto trucks over horse-drawn trucks is a matter of every-day occurrence in the operation of a large express company in Chicago. This company is operating about equal numbers of auto trucks and horse trucks. An important part of their business is the delivery of freight at a point about 25 miles out.

The following procedure has been found most efficient and economical: A three-horse truck, loaded, is started out on the long trip early every morning. At noon a loaded motor truck is started on the same run. The latter ordinarily carries three times the tonnage of the horse truck. The motor truck makes the trip in $1\frac{3}{4}$ hours, unloads and waits for the horse truck. This is unloaded on arrival and the horses are unhitched and led up a plank into the body of the motor van.

The wagon is fastened to the rear of the motor truck and at 6 o'clock or even earlier the whole outfit is back at the stable ready for a trip the next day. The horses apparently suffer no ill effects from the rough ride in the auto and, in fact, are thought to enjoy it. As will be seen, this device actually doubles the tonnage hauled by the horse truck without in any way cutting down the tonnage of the motor truck.

Recent investigation has developed the fact that 67 out of every 100 taxicab drivers in London were formerly drivers of horse-drawn public vehicles.

A REAL REVOLUTION IN AUTOMOBILE-ENGINE DESIGN

By ANTON CAMILLE

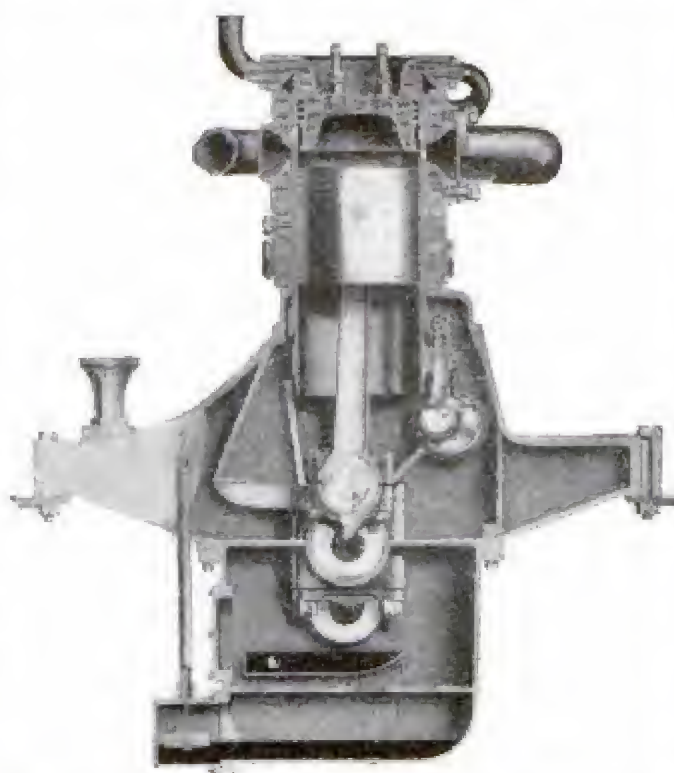
VERY much of a sensation has been created in American automobile manufacturing circles by the announcement that three or four prominent firms in this country, after exhaustive examination and tests, have decided to discard the long-established poppet-valve type of gasoline motor in favor of the Knight sleeve-valve construction. And to add force to the innovation, several foreign licensees of the highest prestige—makers of the Panhard, Daimler, Mercedes, and other famous cars—have entered upon vigorous advertising campaigns to sell in this country their newest models, equipped with the same motor.

The history of the Knight motor is so interesting that a few words concerning it are almost essential to an understanding of the present situation. Designed by a Chicago engineer, Charles Y. Knight, the motor was built in a small way for several years. But that prophets are without honor in their own country was never more notoriously emphasized than in the reception encountered by the new engine. It was not until after a long period of indifferent business and financial struggle that the new motor loomed suddenly into prominence in England, as a result of its remarkable performance in very successfully passing some exceedingly severe tests imposed by the engineers of a British automobile club. Almost immediate adoption

by several big manufacturers abroad was succeeded by nearly two years of extending use and uninterrupted success, before the present awakening on this side of the Atlantic to the fact that here was really distinct and important improvement, and not mere difference, in automobile motor design.

Now that the tide has turned, however, it seems to have turned hard, and for the student of mechanical progress the United States Patent Office presents interesting evidence of a scramble on the part of designers to get in line with all sorts of both doubtful and promising variants from previously patented schemes of sleeve, piston, rocker, and other valves that dodge the shortcomings of the poppet-valve construction. Zest is lent to the competition by the rumor that Knight's European contracts interdict the licensing of more than four American concerns.

To describe it briefly, the Knight motor is one of conventional enough four-cycle design, except for the fact that the admission of the charge and the exit of the exhaust are controlled by two sliding sleeves to each cylinder, instead of by cam-actuated poppet valves. The sleeves are two to each cylinder, about $\frac{5}{8}$ in. thick in an ordinary motor, and are ground outside and in. The outer sleeve slides within the cylinder, the inner sleeve within the outer, and the piston



Vertical Section of One Cylinder of the Knight Motor, Showing the Connecting Rods for Actuating the Sleeves, the Two Spark Plugs in the Cylinder Head, the Sleeve and Cylinder Ports, etc.

within the inner sleeve. Both sleeves are positively reciprocated by small cranks, and ports or openings cut in their sides register with cylinder ports at the proper moments of the cycle. With reasonably close fitting, no troubles are experienced from leakage, heating, breakage, etc., while the advantages are numerous.

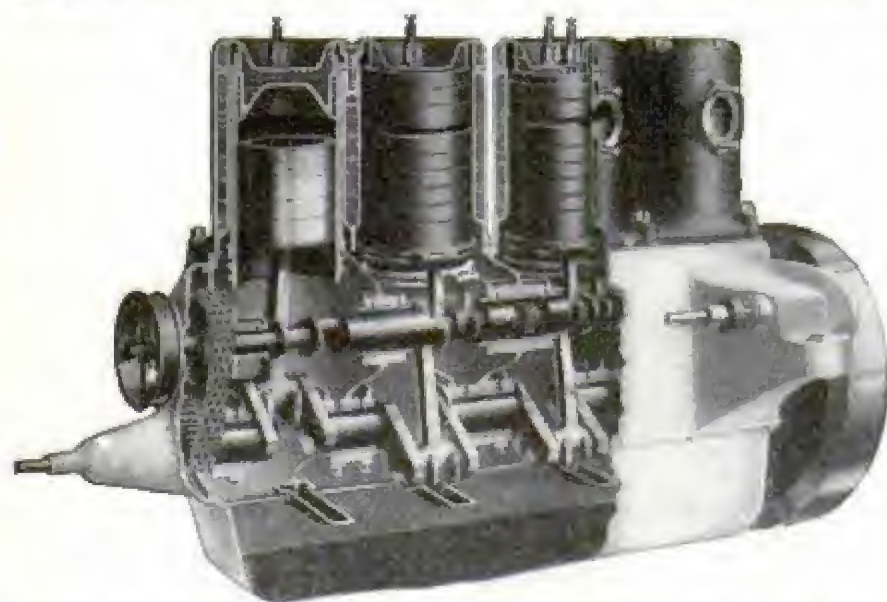
The positive action of the cranks actuating the sleeve valves is a vast improvement over the nonpositive cam movements of poppet-valve mechanisms; the very large port openings reduce wiredrawing of the incoming charges and free the exit of the exhaust; no noise is made by the valve mechanism; the combustion chamber is made to approximate the spherical form known to conduce to highest efficiency; wear of a character to impair the operation or require frequent readjustment is almost eliminated; and lubrication and complete inclosure of all working parts are facilitated. Several of these conditions are, of course, well understood to make for higher power and efficiency than are com-

mon, so it is no more than might be expected that in addition to an altogether exceptional reliability and durability the new motor is low in its fuel consumption and very powerful for a given cylinder capacity.

The exact relation of the positive-acting valve motor to the future of automobile-engine practice presents a number of puzzling features to those who attempt to prophesy beyond an immediate future, during which it is safe to predict that the poppet valve may tend to disuse.

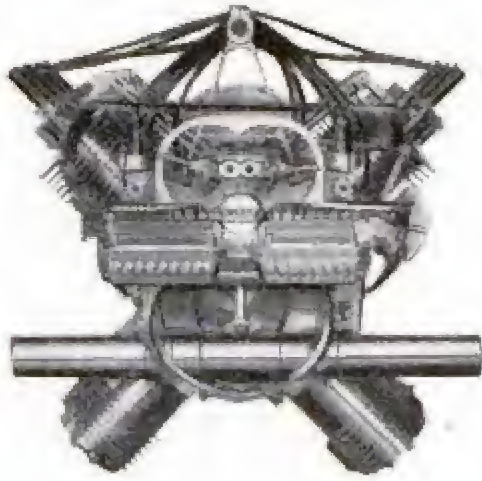
But a good many engineers believe that some day, sooner or later, air cooling must supplant the present water works and plumbing with which automobile construction is complicated, and which besides being a considerable source of cost in the factory is a prolific source of unreliability and trouble on the road, particularly in winter climates. And as none but poppet-valve motors lend themselves in the least to air cooling, it is more than probable that the last word is not yet said against this type.

Indeed, if there be taken the view of men who have served in consulting capacities for automobile-company engineering departments, rather than the opinions of conservative business interests that in the United States have been disposed to copy tried constructions in preference to the development of new ones, it seems probable that ultimate victory will rest with poppet-valve designs that have been long suggested but little exploited. Fuel injection, internal scavenging, and eccentric or crank operation of the valve mechanism, in conjunction with the rapidly progressing European scheme of multiple valves, seem to offer the most promising possibili-

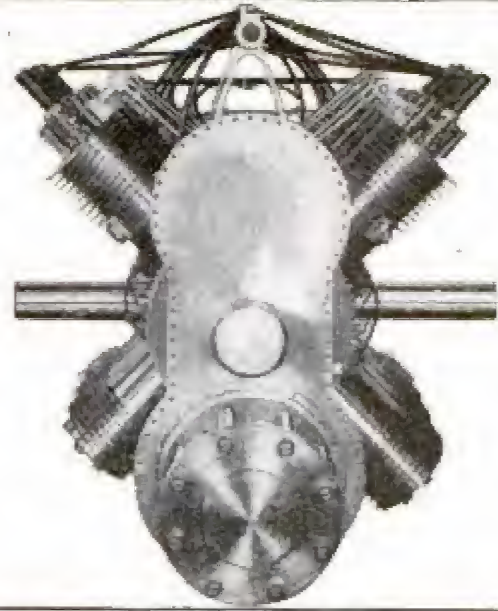


View of the Knight Sleeve-Valve Motor, Given Partly in Section to Show Main Working Parts

The valve-actuating shaft, shown above the engine crankshaft, is driven from the latter by the silent chain seen to the extreme left. The speed reduction is two to one. The two small cranks that reciprocate the sleeve valves for the first cylinder are clearly shown just to the right of the chain. The sleeves of this cylinder are shown in section. The front half of the casing of the second cylinder is entirely removed to show the outer of the two sleeves, in the upper part of which is seen one of the port openings. The small connecting-rods for reciprocating the sleeves are shown under the second and third cylinders. A good idea of the water-jacket construction may be obtained in the third cylinder. The small troughs in the lower part of the crankcase form part of the lubrication system, which is partly force feed and partly splash. The troughs are automatically raised and lowered with the opening and closing of the throttle, thus economizing oil on the lower speeds.

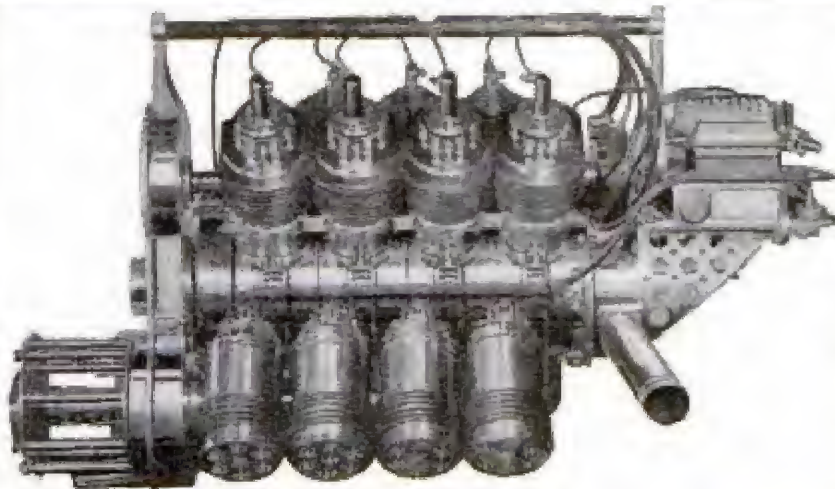


Rear View.



Front View

Loughheed eight-cylinder, V-shaped aviation motor, a recent American invention. Weighing less than 100 lb. and of a fuel and lubricant economy that is very high, it nevertheless is claimed to



be capable of standing up to the steady delivery of over 60hp. The motor is built almost entirely of chrome nickel steel. Fuel injection is employed, eliminating the carburetor.

ties, especially as they have already proved the road to some quite remarkable, though not yet widely published

results, in the design of certain aeronautical motors experimented with in a quiet way in this country.

TEETH OF MAN OF HALF MILLION YEARS AGO

A primitive cave dwelling, believed by scientists to have been a human abode as far back as half a million

years ago, was recently found in the cliffs at La Cotte, in St. Brelade's Bay, Jersey, Eng. After about three weeks'



The Teeth of a Man Who is Believed to Have Lived 500,000 Years Ago



The Corresponding Teeth of an Adult Male of Today

work, the floor of the cave was laid bare, and a hearth was found containing a quantity of wood ashes. In one corner was a mass of bones and teeth, among which were found the nine teeth shown in one of the accompanying illustrations. These teeth are said to be those of one of the dwellers of the cave, who lived 500,000 years ago, and is the earliest known type of man.

They are remarkable for their massive roots, indicating great muscular strength. The three in the top row,

reading from left to right, are the first right molar, the second left premolar, and the second left molar from the upper jaw. Those in the lower row, from the lower jaw, are the second right molar, second right incisor, left canine, first left premolar, second left premolar, and second left molar. They are reproduced in actual size. The other illustration shows the corresponding teeth of the adult male of today, and are arranged in exactly the same order for comparison.

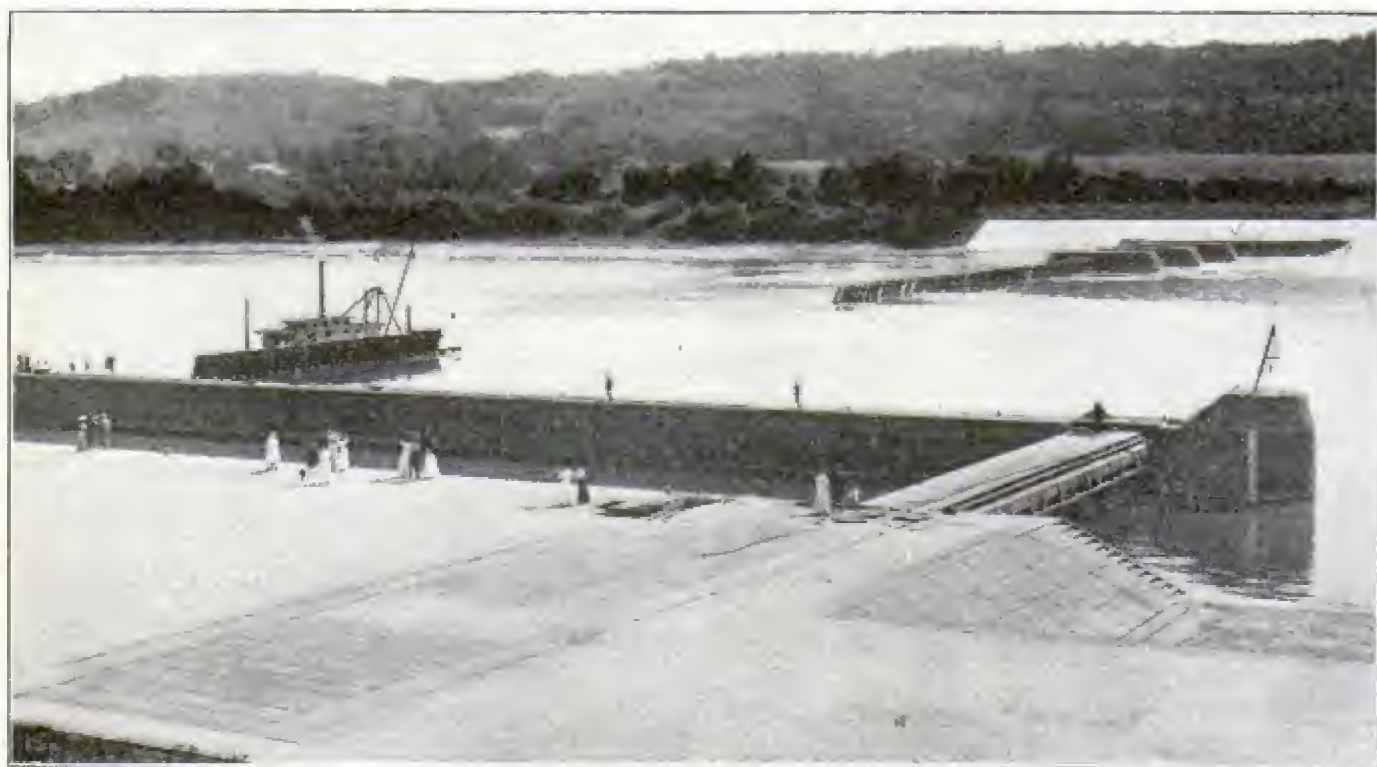
WICKET DAMS TO MAKE THE OHIO RIVER NAVIGABLE

After nearly six years of hard work, Uncle Sam's latest and greatest engineering feat, the Fernbank dam, in the Ohio River, is completed.

The big dam, known officially to the government as No. 37, swung open its big lock gates for business when the largest river steamer on the Ohio passed through there on July 25. But Uncle Sam went about his business there as if it were an everyday occurrence, there was no celebration then, but for one week early in September the people of the Ohio Valley came

to Cincinnati and there was more than \$30,000 worth of fun just because the big dam marked another step toward making the Ohio River navigable the year round.

This new engineering feat is the largest movable wicket dam in the world, and furthermore it is the only one built entirely of reinforced concrete. It cost the government \$1,500,000, but it is a beauty, and Uncle Sam is so well pleased with it that he is going to build more like it in the Ohio River until the entire stream is pooled



The Fernbank Dam from the Ohio Shore, Showing the Placing of the Movable Wickets Forming the Dam across the River, and Also Showing the Lock or Canal along the Ohio Shore through Which All Boats Must Pass

from Pittsburgh to Cairo, a distance of more than 1,000 miles.

The Fernbank dam gives Cincinnati a permanent harbor of not less than 9 ft. of water, and navigation can be carried on for a distance of 12 miles upstream and for 12 miles downstream from Cincinnati to the location of the dam. It takes a small army of men to care for this big dam and there are neat little government houses for some of these men to live in. A new little village has suddenly sprung into existence, under strict government control.

WOMEN UNLOAD SHIP DURING STRIKE

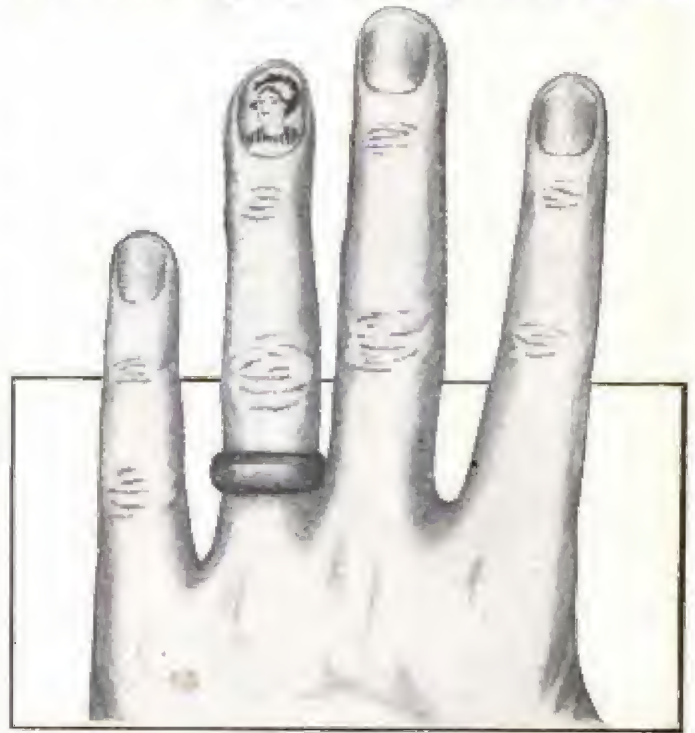
At the commencement of the shipping strike at Hull, Eng., the steamship "Titania" was left without men to unload its cargo of butter. A number of stewardesses and other women employes of the company took the places of the men on strike, and, under police protection, unloaded the ship until the hostility of the strikers compelled them to cease work.



Women Unloading Butter from a Ship during the Shipping Strike in England

PHOTOGRAPHS MOUNTED ON THE FINGER NAILS

One of the latest fads in Germany is the mounting of photographs on the fin-



The Latest Fad in Germany is the Waterproof Mounting of Photographs on Finger Nails

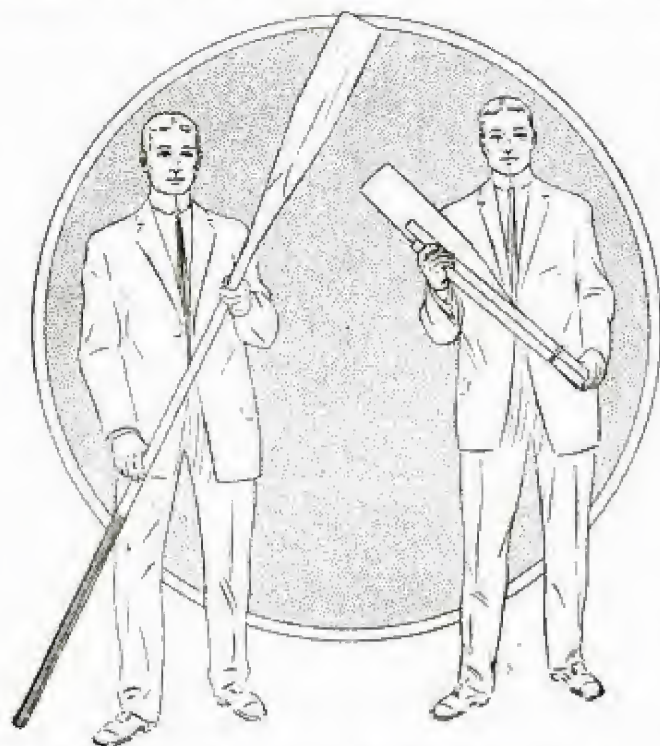
ger nails, the idea growing out of the whim of a cousin of the Kaiser, who had an enameled portrait of her fiancé worked on the nail of her little finger. This portrait was a work of art and cost \$90, but now the fashionable manicures of Berlin have taken up the idea in the photograph form.

The feature of this work by manicures is rendering the photograph waterproof, which is done by coating it over with a shellac-like substance burned upon the nail. It is said that, with careful handling, a photograph so mounted will last about four months without renewal.

Something of the romantic and picturesque which clings to the prospecting and discovering of gold appears in the name of the newest camp in Nevada—"Awakening"—in the Slumbering hills, says the Mining and Engineering World. It is said to have been named by a woman, and gives proof that feminine fancy can not be subdued by the hardships and rough surroundings of a mining camp.

EMERGENCY FOLDING OARS

The possibility of the engine stopping at inopportune times makes at least one pair of oars a necessity on



Emergency Folding Oar for Motorboats in an Extended and Folded Position

board a motorboat. The storage of oars on a small boat, however, unless it is provided with a stationary top, is so difficult that one boating company has brought out a folding oar. Each oar weighs only 6 lb. and can be stowed in a locker in a space of 2 ft. 9 in.

TRAIN OF MELONS MORE THAN MILE LONG

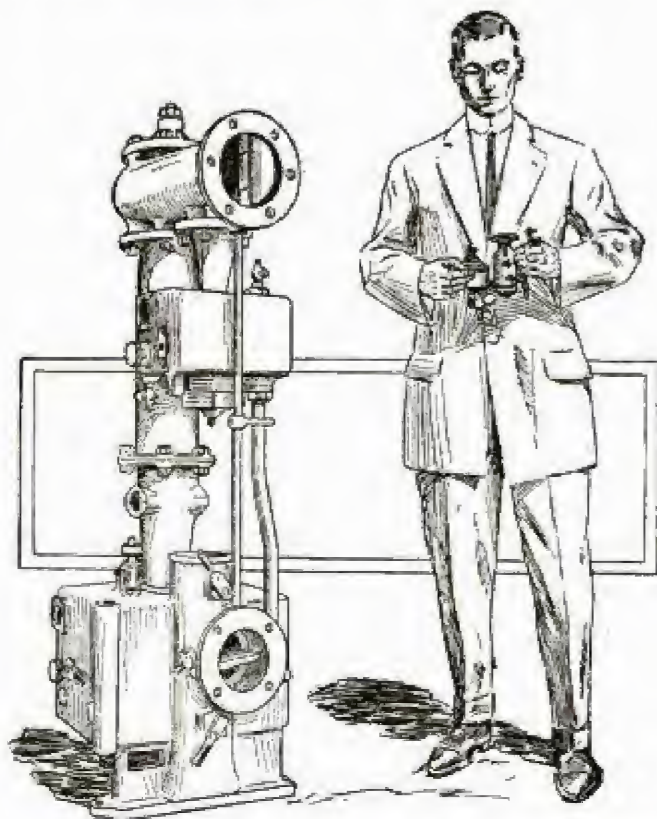
The transportation of melons from the Imperial Valley during the past season is considered one of the most remarkable crop movements in the history of the Southern Pacific Railroad. The total number of cars shipped was 2,700, which is about 900 more than in any other season. The biggest day's packing was June 11, when 133 carloads of cantaloupe were harvested and transported from Brawley, the shipping center, to Imperial Junction, in one train, the length of which was 6,175 ft. There were 324 crates in each car and 45 melons to the crate, which

makes a total of 14,580 melons to each car, and 1,939,140 melons on the train. The amount of ice required in the field and at Yuma, Arizona, to take care of the Imperial Valley shipments was 56,000,000 lb.

AN IMMENSE CARBURETOR

What are claimed to be the largest carburetors ever made were recently constructed for use on a number of gasoline-electric interurban cars built to the order of an American railway company. The gasoline vaporizer and mixing device illustrated herewith is one of these. It stands nearly five feet high, and is designed to serve an eight-cylinder, V-shaped gasoline motor which delivers 167 hp. (125 kw.) at a speed of about 600 revolutions a minute.

Most people are more or less familiar with the carburetors used on automobiles. The man in the picture is shown holding one of these in his hands, in order to furnish a contrast with the mammoth carburetor made for the interurban cars.



The Largest Carburetor Ever Made for Use on a Gasoline Motor Contrasted with an Automobile Carburetor Which the Man Holds in His Hands



Holbrook Blinn, star of "The Boss," receiving a 2-by-4 beam from Edgar Selwyn, author of "The Country Boy." Mrs. Blinn assisting, while Mrs. Selwyn (Margaret Mayo, author of "Baby Mine") sits on a saw horse and bosses the job of building the Blinn barn at Croton on the Hudson



Holbrook Blinn is an Honest-to-Goodness Carpenter. Look at His Overalls



Mrs Edgar Selwyn (Margaret Mayo) Doing a Little Job of House Painting

COMBINED KITCHEN TABLE AND IRONING BOARD

Among the new furniture offerings for the kitchen is a combination kitchen table and ironing board. The



A Kitchen Table with Disappearing Ironing Board

front half of the table top is held in place by means of dowel pins, and is easily lifted and laid back over the rear portion of the top when the table is to be used for ironing. The ironing board, which is contained in the space under the removable portion of the top, is then raised and locked in place at just the right height for ironing.

EXPLOSION ENGINES AT ONE POUND PER HORSEPOWER

This is not an account of some wonderful invention that is going to revolutionize the art of flying, but merely the rattling of an old skeleton in the mind closet of an engine designer, who, in the light of modern progress in the construction of internal-combustion engines, proposes—we do not know how seriously—to construct engines capable of developing power at the rate of 1 hp. for each 1 lb. of weight of prime mover.

The proposition is set forth in a recent issue of the French journal *Cosmos*. The idea itself is older than the successful internal-combustion engine. It is a resurrection of the old gun-

powder engine, in which an early inventor proposed to use the explosive force of gunpowder to generate power. The writer considers one of the latest forms of machine guns used in the French army, and shows by the aid of figures that a 100-lb. gun, during the time it is in action, develops 100 hp. in power and delivers it to the projectiles fired by the gun. From such a gun to an industrial engine using nitroglycerin seems but a plausible step in the mind of the writer, but to the lay mind an airman using such an engine in his aeroplane would seem to be taking more liberties with death than even the exigences of progress and science would seem to demand, while the spectacle of a fleet of nitroglycerin-propelled airships fighting a battle in the air would indeed be terrifying.

PORTABLE MACHINE MAKES RAILROAD TIES

Instead of hauling the lumber to the sawmill, the owner of this machine, which is propelled and operated by draft animals, may take it out into the woods or wherever the lumber may be, and make his ties on the spot, at an estimated saving of 50 per cent for



Portable Railroad-Tie Cutting Machine

hewn ties. This machine is the recent invention of a Kentucky man and has a capacity, it is said, of 250 ties a day.

The four knife blades are mounted



The International Cup Defender Lying Low at Slow Speed

on a vertically movable carriage, the width adjustment being made by a handwheel. Two sides of a tie are faced at one operation, and the other two sides may be faced by simply turning over the tie for the next downward cut. The power is transmitted to the carriage by means of a sweep and screw, and counterweights are used to elevate the carriage after the cut.

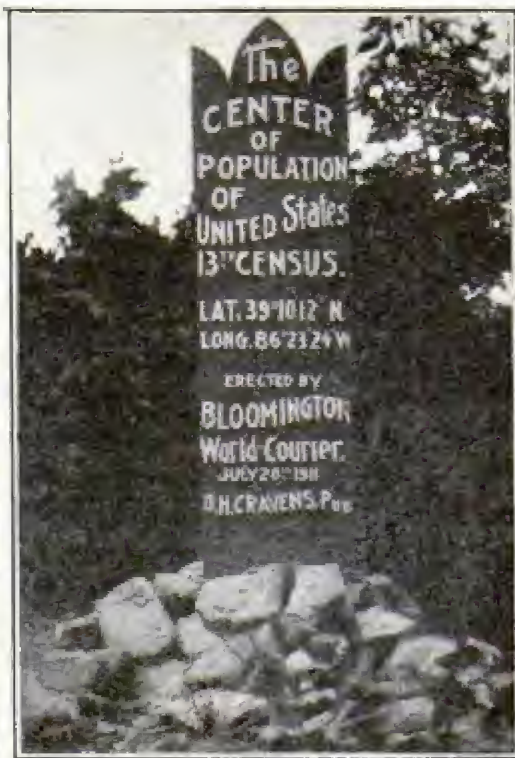
ⒸIn military maneuvers with aeroplanes in France it has been discovered that airmen flying at an altitude of 600 ft. can locate submarines 30 ft. below the surface.

"DIXIE IV" MAKES FIFTY-SIX MILES AN HOUR

"Dixie IV," built to defend the British international trophy against the English challenger, is said to have made 56 miles an hour in one of her trials over the international cup course at Huntington. The illustrations show the "Dixie IV" at low speed, and raising her hull out of the water at a speed of 45 miles an hour. One of the interesting features of this boat is the raised seat on the stern, which elevates the steersman above the water and clouds of spray thrown by the boat at high speeds.



Making 45 Miles an Hour, and Illustrating the Necessity of the Raised Steersman's Seat



The Mosier Farmhouse Near Bloomington, Ind., Back of Which Center of Population is Located

Pile of Rock and Monument Marking the New Center

THE CENTER OF POPULATION OF THE UNITED STATES AS DETERMINED BY THE RECENT CENSUS. IT HAS MOVED STEADILY WESTWARD SINCE THE FIRST CENSUS

A CURIOUS ELECTRICAL (?) PHENOMENON

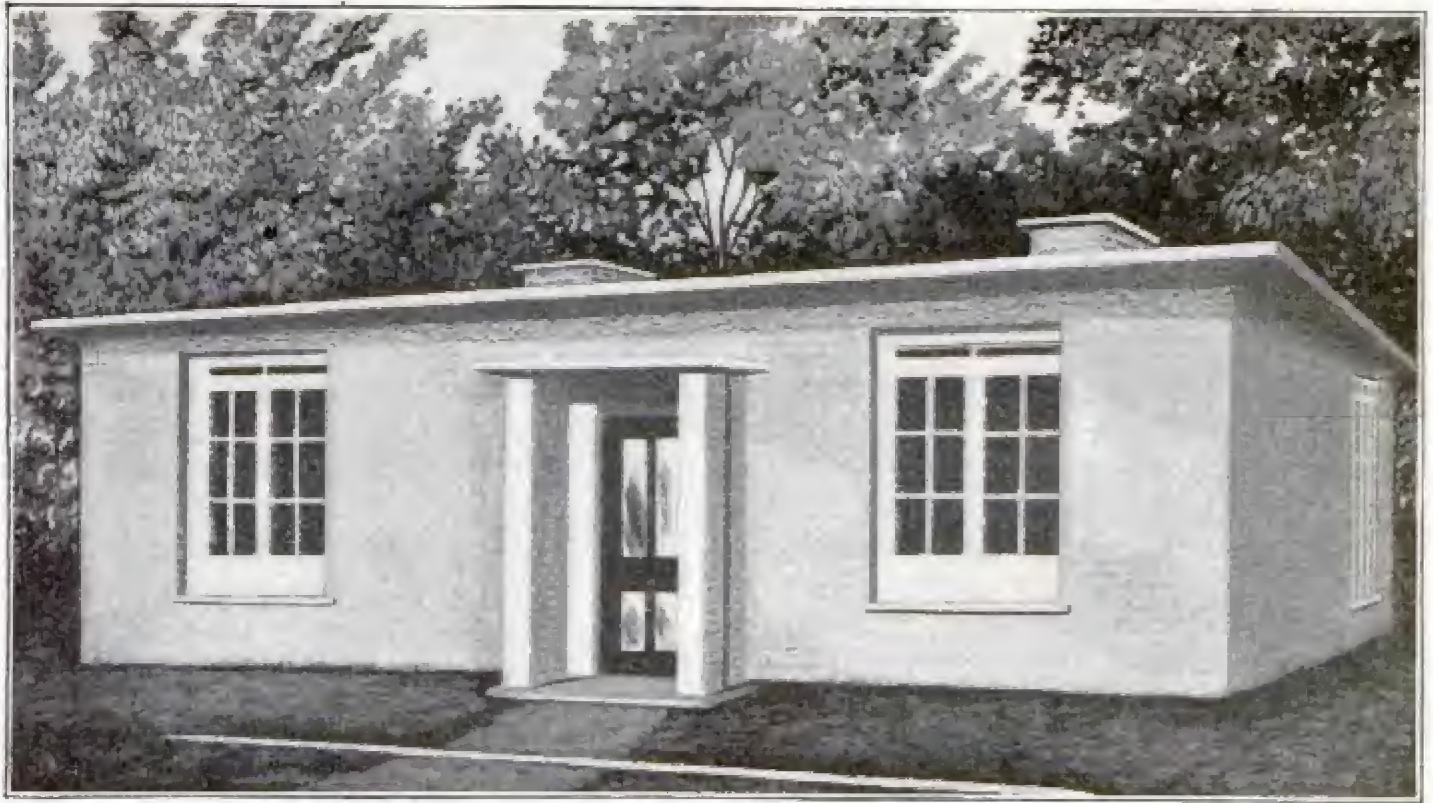
A phenomenon described as absolutely unique and suggested by a well known technical authority as being due



The Flare above the Sail of the Fishing Vessels in This Picture May Have Been Due to Atmospheric Electricity, and is Similar to the "St. Elmo's Fire" Sometimes Observed as a Luminous Electrical Discharge from the Masts and Spars of a Ship at Sea

to an electrical cause, is recorded by the Electrical Review, of London, England. The illustration herewith is a reproduction of one of several photographs of fishing boats taken by a Newcastle man while on a yachting cruise in Scotch waters. All of the pictures showed a peculiar white glare extending skywards from the masts and yards of the boats, and a close examination of the photographs discredited the belief that this effect might be due to a defect of the camera or to some kind of halation. A reference to an electrical expert elicited the suggestion of electricity as the cause, especially as there had been thunderstorms during the previous two days and the neighborhood was probably not yet cleared of the effects of the electrical disturbances in the upper atmosphere.

CHavre and other French cities are using a new method to allay the dust nuisance. Roadways are sprinkled with common salt and then watered freely.



Type of Bungalow Built for English Laborer

ENGLISH LABORER'S BUNGALOW

Comfortable, sanitary, and inexpensive cottages for agricultural laborers are being built in many parts of England under the supervision of county associations organized for the purpose. Such a cottage, built in Herefordshire, is here shown. The walls are of brick, coated with cement concrete, and the roof is of concrete, $4\frac{1}{2}$ in. thick. The sills and the window and door heads, are also of concrete. The cottage has a combined sitting room and kitchen, 19 ft. by 14 ft., and

three bedrooms. There is a wash-house at the back. The cost of the cottage, including foundation work, was about \$800.

TRAIN OF SELF-PROPELLED MOTOR TRUCKS

A motor-truck train, the engine car of which is simply a traveling electric central station, supplying current to each of the self-contained motor trucks following it, is being used with considerable success in Germany. Each wheel axle of the motor trucks has its own motor and driving gear, and suffi-



Train of Self-Propelled Motor Trucks Provided with a Traveling Power Station in the Form of an Engine Car

cient power is provided by the engine car to allow 10 trucks being coupled up in a single train.

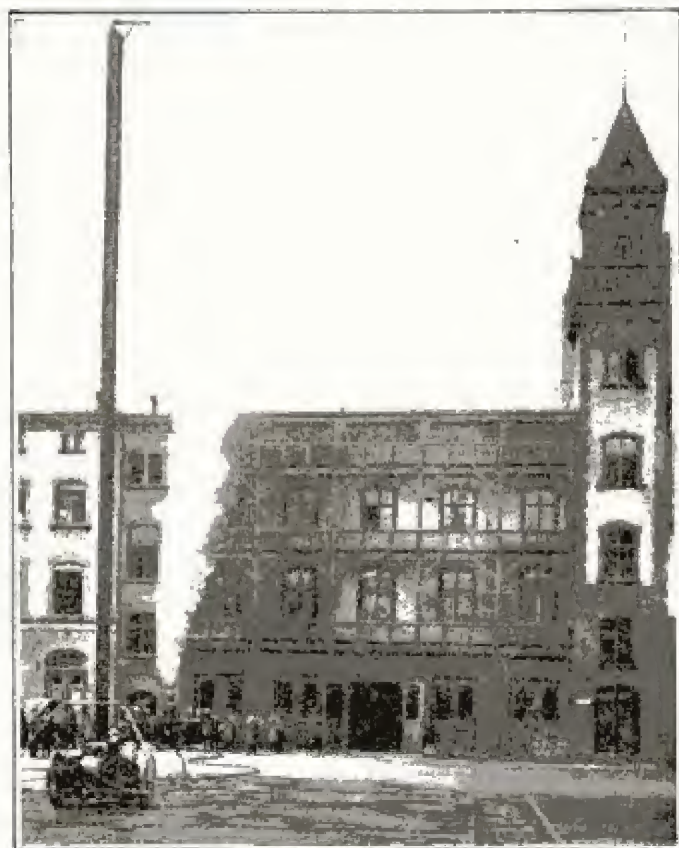
The engine car carries a gasoline engine at each end, and each drives a dynamo. These two generating sets are operated singly or together, according to the length of the train and the condition of the roads. The cable distributing the current to the motor of each driving axle can be coupled and uncoupled between the trucks. Besides the cable coupling, each trailer is provided with mechanical clutches, which serve to automatically steer

them on the path taken by the engine car as well as serving to connect them together.

The road train illustrated, consisting of a traveling power station, and six self-propelled motor trucks, can transport a net load of 33 tons at a maximum speed of eight miles an hour. The starting of the train is effected by means of the dynamo regulators as smoothly and steadily as when gradually opening the steam valve of a locomotive. The electrical brake acts uniformly on all the wheels of the train.

GIANT FIRE-FIGHTING WATER TOWER

The new collapsible water towers of the Berlin fire department are interesting because of the great height



A German Fire-Fighting Water Tower That will Discharge a Stream of Water Straight into the Eighth Story of a Building

to which they can be extended and the little space they occupy when collapsed. When collapsed the tower has a height of less than 5 ft., and can be transported on an ordinary wagon instead of requiring a long truck that

is difficult to steer through the streets. The tower can be extended to a height that will enable a stream of water to be discharged straight through the windows of the eighth story of a building.

BLASTING ROCK WITH WATER PRESSURE

A process of rock blasting by which water pressure is substituted for powder has, according to the Mining and Engineering World, been invented by a German engineer. The method consists of suddenly increasing the water pressure in an apparatus placed in the bore hole. There have been many water-pressure processes of rock blasting proposed, but in the majority of them the pressure has been exerted gradually and as a result the stone to be broken has been crushed at the ends of the expansible sleeve. This crushed material is forced forward in the form of powder toward the bearing point of the sleeve, thus causing it to expand too soon and leak. It is claimed that in the German system the sudden pressure acts in such manner that crushing cannot take place. Instead, the force first applied tightens the plunger and the expanding sleeve, filling the bore at comparatively low pressure. Then by one or two sudden strokes of the plunger the pressure is suddenly increased and the mass of rock broken.



Electric Switching Locomotive of the New Articulated-Truck Type

NEW ELECTRIC SWITCHING LOCOMOTIVE

The first articulated-truck electric locomotive of large capacity built in this country for switching purposes in the freight yard of a trunk line has recently been constructed and delivered to an eastern railroad company.

The new locomotive is a 79-ton machine with a central steeple-type cab and four double-geared motors. The pulling force of the motors is transmitted through the truck frames, which are located outside the wheels and joined by bolsters (crossbeams forming bearing pieces) at the middle of each truck, hence the designation "articulated" which means jointed.

The driving wheels are massive affairs, 63 in. in diameter, and are driven by gears through a system of springs. These gears are mounted on hollow shafts inclosing the axles. These hollow shafts, or "quills," as they are technically termed, are supported by bearings on the motor frames. The motors operate on alternating current at 190 volts, and are designed to produce

about 230 hp. each for one hour, or 165 hp. on a long continuous run. They are kept cool by forced air ventilation through their working parts, and are provided with spring suspension. The air blowers are electrically operated.



Driving Wheels of Electric Switching Locomotive

The adoption of electric switching locomotives in railroad yards not only

increases the speed of handling cars but also reduces the cost of operating, besides enabling the use of much lower engine powers. It has been conservatively estimated that a steam switching locomotive burns three times the coal

that is required at the power station to furnish current for operating the electric type of locomotive, and this in a measure accounts for the displacement of steam by electricity in switching service.

ILLUSTRATED SONGS IN THE HOME

A new attachment for the phonograph is a device which illustrates the text of songs as they are sung, by pro-



While Music is Playing, Pictures on Circular Disk are Projected from Small Light Chamber on Right, through the Horn of the Phonograph, onto the Circular Screen in Front

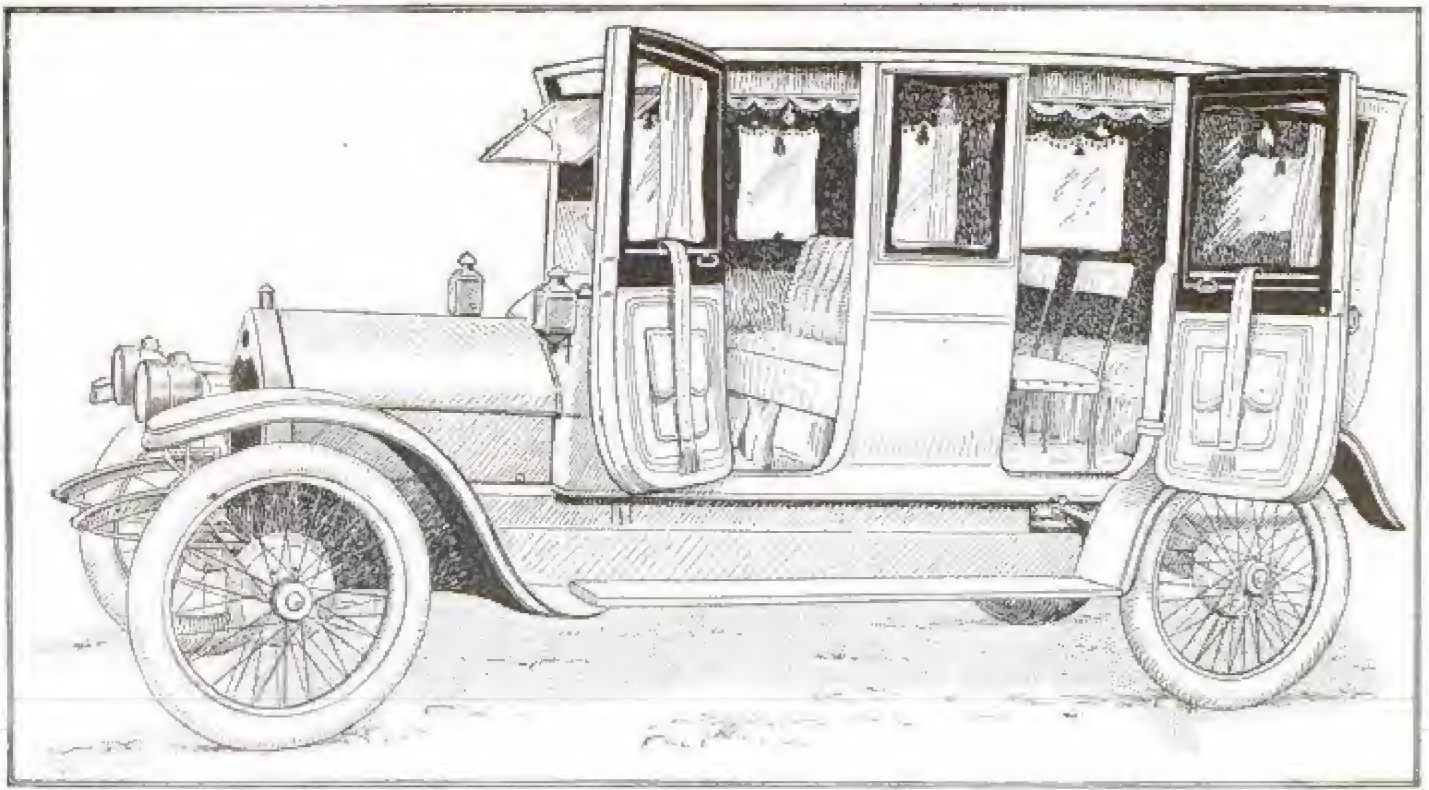
jecting lantern-slide views upon a screen in front of the horn. A small electric-light chamber is attached to the small end of the horn, and a disc containing the slides is placed in front of it, and moved at regular intervals by the motor of the phonograph. Thus a popular feature of the low-priced theaters can be made a part of the home entertainment. Of course, the song record and the picture disc are designed to be sold in pairs, so that words and illustrations will harmonize. This device does not interfere with the use of non-illustrated records.

Ⓐ St. Louis gas company is now covering its wrought-iron piping with layers of pitch and paper as a protection against electrolysis.

STEAM BOILERS HEATED BY ELECTRICITY

At the rate at which electricity is retailed for ordinary consumption, it would be nothing short of financial suicide to attempt to heat water by electricity on anything but the smallest scale, where utility and dispatch are of more consequence than cost. But there are some cases in which an electrically heated boiler may prove an actual economy. Such an instance is furnished in railroading, in the case of trains running over sections of track on which electric locomotives are used, as on one of the big railroads entering New York City from the north.

An electrically heated steam generator is now being made by a New York concern to meet this requirement in railroading. It is an adaptation of the usual vertical type of steam boiler, but instead of the fire tubes being heated by the products of combustion of a fire they are made to inclose electric heaters of special design. The resistance wire, which is heated by the electric current, is wound on soapstone spools which are threaded on a metal rod alternately with porcelain insulators of larger diameter, the whole being inclosed by a thin brass tube. The interstices between the spools and the tube are filled with fine sand. A boiler 4 ft. 6 in. long and 3 ft. 10 in. in diameter, with one hundred and forty-eight 2-in. tubes, and electric heating elements of the type described, is able to



An Automobile Which Has the Driver's Seat Inclosed in the Same Manner as the Rear Seat

produce 850 lb. of steam an hour at 110 lb. pressure. The efficiency is over 90 per cent.

COMPLETELY INCLOSED AUTO BODY

This 20-hp. English automobile has a Pullman auto body of new design, the front or driver's seat, as well as

the rear portion of the body, being completely inclosed. Access to the front and back seats is given through separate doors. Ordinarily the driver's seat is shut off from the rest of the car by a glass partition, but this may be dropped when desired, which is an excellent idea when the owner is operating it himself. The interior furnishing of this car is luxurious.

A SCHOOL OF PHOTOGRAPHY

Photography is considered so much more of an art in Europe than in the



The Munich School of Photography

United States that schools of a considerable size, and having a large staff of instructors, are devoted to its teach-

ing alone. One of the finest of these schools is the Teaching and Experimental Institute for Photography, at Munich. The contributions to this school from the government, the city of Munich, and private citizens, make a total of \$8,000 a year.

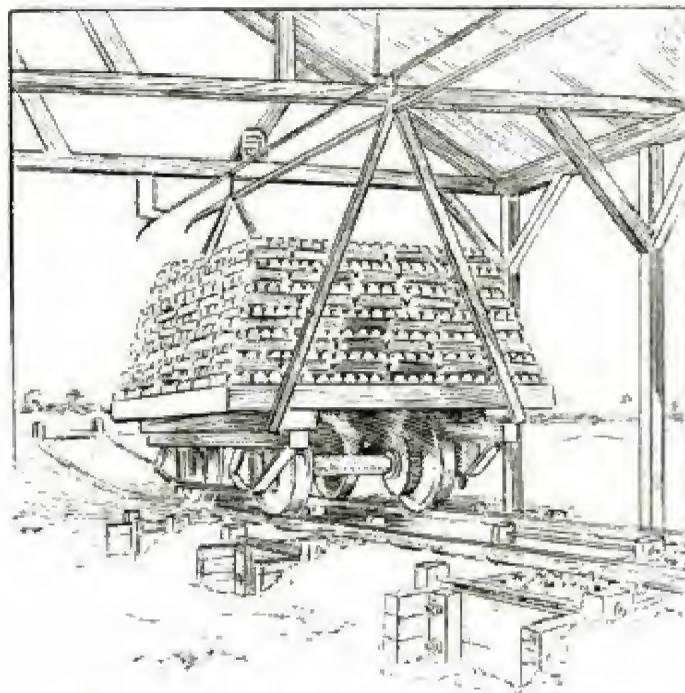
The school has no less than 90 rooms, among them being included two skylight studios, four modern drawing-room studios, one reform studio, seven darkrooms, several laboratories for enlargement and reproduc-

tion, the departments for copper etching and autotype, and of photography for criminal investigation, rooms for

testing materials, photochemical laboratory, Roentgen department, draftsmen's and printers' rooms, library, etc.

TESTING BALLAST FOR RAILROAD TRACKS

The testing of materials of construction is one of the most important branches of engineering science, for it is often cheaper to devise a special



The Testing Car Loaded with Pig Iron

test, even at the expenditure of many thousands of dollars, than to trust to the haphazard and expensive scheme of trial and error in the school of experience.

One of the most unique tests of this kind was the one recently carried out by a great American railroad company, to determine the necessary depth of stone ballast for railroad tracks under stated conditions. A series of experiments extending over a period of nearly two years was undertaken with the apparatus shown in the accompanying illustration. This consisted of a piece of track over which was run continuously back and forth, at the rate of five miles an hour, a two-axle truck of 9-ft. wheelbase and loaded with pig iron so that the gross weight amounted to 150,000 lb., or 75,000 lb. per axle. The ballast to be tested was placed under the track in

three boxes, open at both ends, and after the settlements in the boxes amounted to about 1 in., the car was stopped and the track raised to its original elevation by tamping the ballast with picks according to the usual service methods. After each of the five prolonged tests which were made, the ballast was cut into sections for examination.

The boxes were covered by a roof to protect them from the weather, and water was poured on the ballast at certain times during the test to approximate to the effect of a predetermined rainfall. In this way, even the exact weather conditions were made known in determining the effects of the test. The car was operated by an electric motor which automatically reversed at the ends of the track. A speed counter on the car registered the number of trips, which amounted in the aggregate to some hundreds of thousands.

The net results of all of the tests was that the committee in charge of the experiments recommended the use of 24 in. of stone ballast underneath the ties for existing conditions of railroad work, and under this a layer of engine cinder, gravel or an equivalent, to act as an absorbent mat to dispose of the water falling on the track and so prevent softening of the roadbed material.

STEAMSHIP "AQUITANIA" WILL EXCEED 900 FEET

The plans of the "Aquitania," now being built for the Cunard line, have been slightly modified to make this ship the largest in the world. She will be more than 900 ft. long, probably 910 or 915 ft., which will make her about 25 ft. longer than the vessel being built in Germany to eclipse the "Olympic" and her sister ship. The speed specifications have also been raised, and she will have a speed of 26½ miles an hour (23 knots), which will make her, next to the "Mauretania" and "Lusitania," the fastest transatlantic liner.

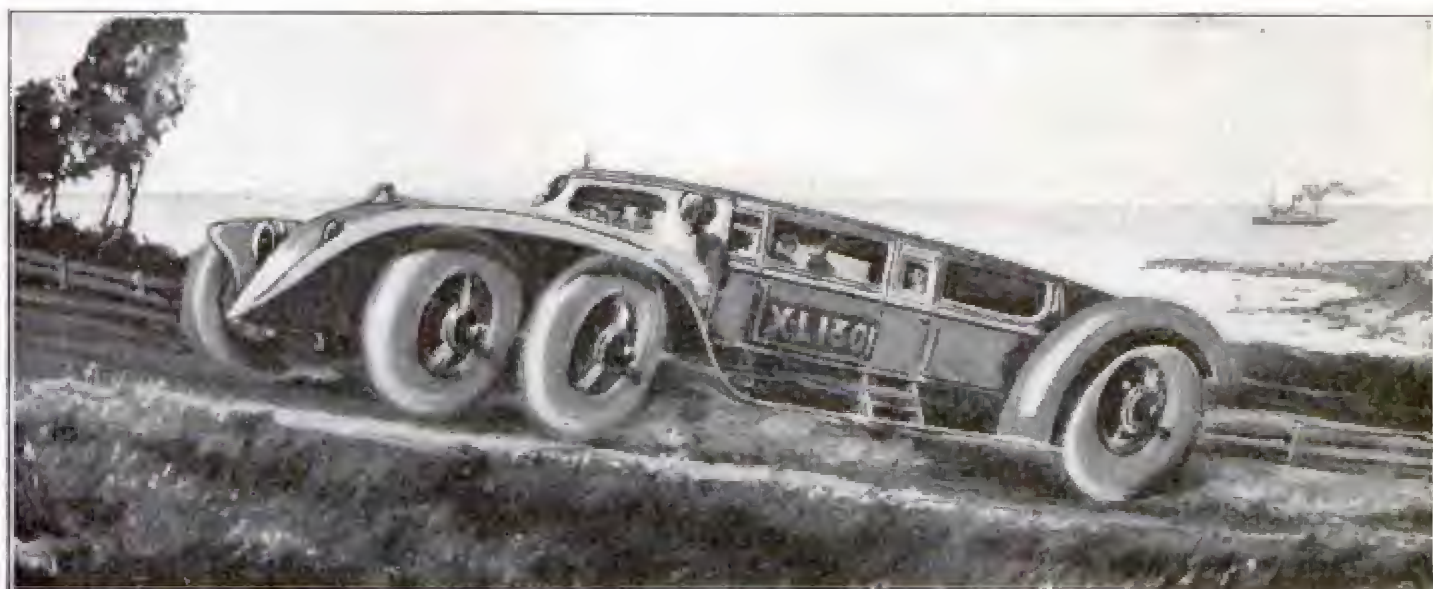


Swiss Village Guard Dressed for a Gala Occasion

SWISS VILLAGE GUARD

During the annual fairs in the Swiss villages, the local guard of each turns out in quaint costumes that have come down through the generations. So

garbed, the officers of the law are admired by the entire population, although they make anything but a martial impression.



Courtesy The Car

How We May Motor in 1961, Fifty Years Hence, as Seen by an English Artist



Entrance of the Log-Cabin "Mansion" with Large
Sleeping Room Above—Sun Parlor is at the Back
of this Section

Log-Cabin "Mansion" of an Artist

By FRANCIS BUZZELL

ABOUT 30 minutes from the center of Chicago by suburban railroad service, among the trees of an oak forest which makes the suburb of Hubbard Woods one of the most ideal of the many stretching along Lake Michigan's shore, is a log-cabin dwelling the like of which would have been difficult to duplicate in the pioneer days.

For a log cabin, it is vast, being a two-story structure, 84 ft. long by 48 ft. wide, and having such conveniences as a sun parlor and sleeping porch, the arrangement of which is so ingeniously handled as to fit in perfectly with log construction. The whole is erected upon a concrete foundation, which, were the dwelling a modern conventional structure, would accommodate a 22-room house.

But we will leave the structural details of the place for the present and make the acquaintance of the man who wanted a big log cabin for a home and overcame the difficulties that stood in the way of his obtaining it. For a vacant house is a poor soulless thing, and such a house as this, whether vacant or occupied, would lose more than half its interest and charm, were the individuality of the man who built it to live in left out of the story.

One day during the summer of last year Adam Emory Albright, an artist who has made an international reputation as a painter of country children, visited the suburb of Hubbard Woods and found therein the ideal spot he had long dreamed of acquiring. Being the manner of man who experiences quick enthusiasms, he made up his mind in five minutes, purchased a 200-ft. frontage on a country road thickly populated on both sides with trees of the oak forest, and decided then and there that the home should be of logs. Then he told his friends. All of them liked his idea of a house, but the practical

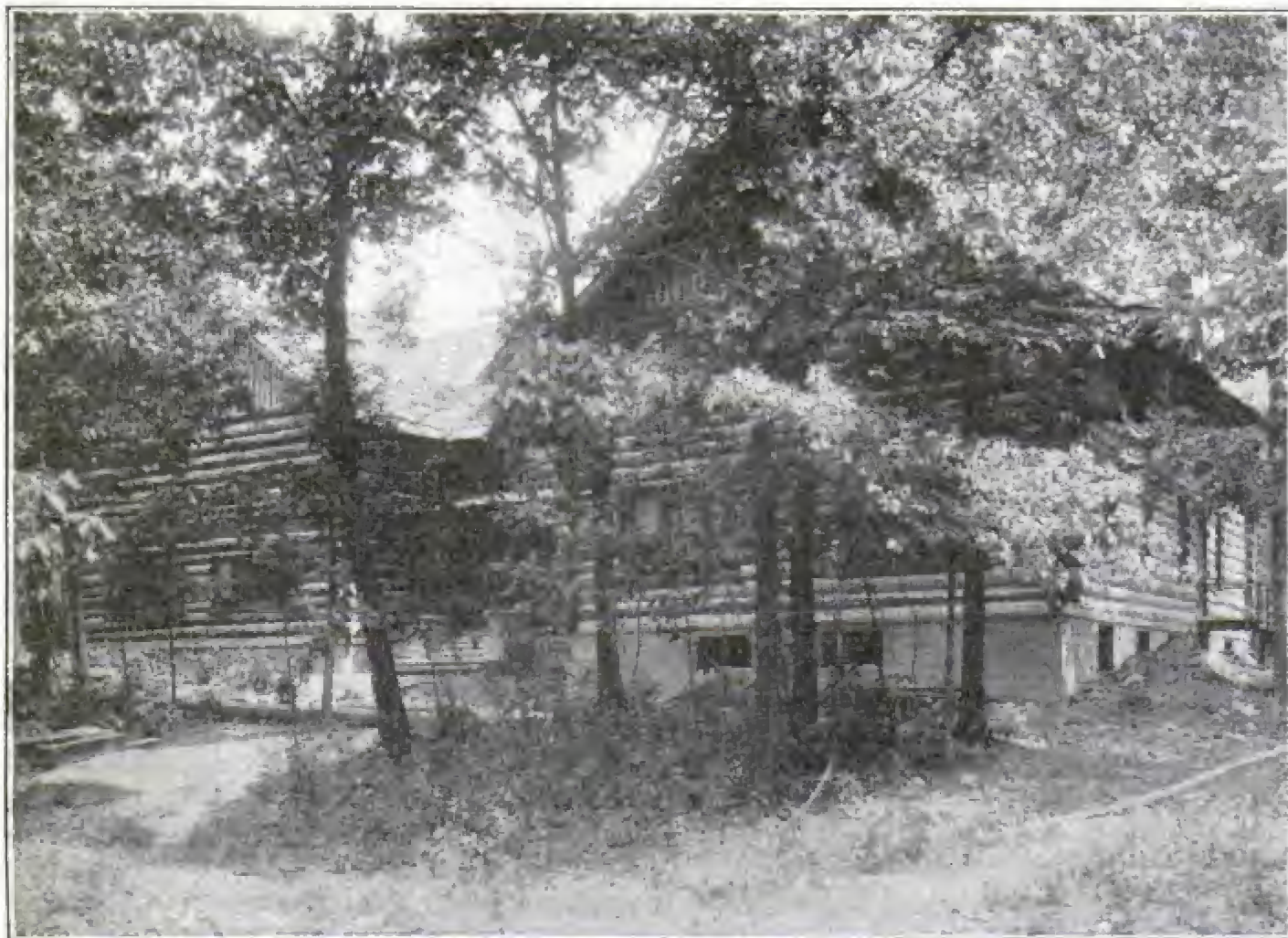
ones shook their heads over the difficulties and insisted such a big log cabin was impossible. But he kept on telling his friends of the idea and one day a couple of weeks later one came along who owned a tract of timber in northern Wisconsin.

"Why, I've got just the logs you want," said his friend, and he had. They were straight Oregon pine logs 60 ft. long, ranging in diameter from 12 to 14 in., and practically the same size at both ends. Mr. Albright made up his mind about these logs in less time than he had required to decide upon the land. The order specified 170 logs 60 ft. long, and they arrived late in the autumn on a train of six flat cars. In the meantime the artist-builder had definitely decided upon the general shape his house should assume and solved the architect problem by drawing his own plans. No architect could have done the thing satisfactorily to him for several reasons, the most important of which was the fact that he was at no time in the early stages quite sure what his general idea would develop into. Minor changes were made from time to time, and the whole structure, with the exception of the concrete foundation, was built without blueprints. The only working plans were charcoal drawings made by the artist as the work progressed. The practical-minded man would laugh at this method of house planning, but Mr. Albright, being an artist, was not practical as a builder. Yet, as you will see as the story progresses, the result would please the most practical as well as the most artistic building constructor.

The foundation being in readiness and the logs arrived at the station, the next problem was the means of transporting them the half mile from the station to the building site. Mr.



Interior of the 32 by 48-Ft. Studio, Showing Size of the Logs and the Method of Interior Treatment. Over the Heavy Oak Doors Leading from the Reception Hall into this Great Room will be a Carved Oak Balcony, Entered from the Second-Story Hall



General View of the Front of the Log-Cabin Dwelling, Showing the Rough and Wooded Nature of the Surroundings. The Section at the Left is the Studio, the Living Section is at the Right



Entrance Hall, 20 by 24 Ft. The Stairway Consists of Solid Oak Slabs 4 Ft. Long, 12 In. Deep and 6 In. Thick. The Fire Place is Made of Clinker Brick. The Door Just Showing at the Right Leads Out onto the Sun Parlor



View of North Wall of the Studio Section, Showing Large Windows which Give the Artist a North Light. The Two Dormers are an Interesting Feature, and One Unusual for Log Construction

Albright didn't know how, nor did the teamsters. Therefore, he started out after information and got it in the form of a former woodsman whom he found in Chicago. The logs were transported by two teams of horses, two logs at a time, or 85 hauls, and this cost just \$118.

Next of the many problems which required solving was the hiring of men familiar with such work. A representative of the carpenters' organization had already arrived on the ground and insisted that the house would have to be built by members of the association if it were to be built at all. "All right," said Mr. Albright, "send along your men. All I want is to get the house built." The men came, did at least \$100 damage to the logs the first afternoon, and then gave up in despair. Subsequently, the association held a meeting, but of all the carpenters in and about Chicago could not find one who could build a log house. The result was another visit from the representative, who admitted that the association was "up against it" and gave Mr. Albright the privilege of hiring any men he wished as long as he hired two carpenters to do the nailing and sawing. He laughingly promised to do this and after a few days search rounded up six woodsmen who were more than delighted to tackle the job. The two carpenters arrived, thus completing the construction force, and it was not long before the representative of the carpenters' association understood the reason for the Albright laugh.

So far, the foundation is down, the logs are on the ground, the carpenters' association has been disposed of to the satisfaction of both sides, the woodsmen are ready, ax in hand, and there are one or two rough charcoal drawings which no one but Mr. Albright understands. The next problem, therefore, and the last for some time, is the tackle for raising the logs. Under the supervision of a civil engineer this is evolved in the form of a derrick 58 ft. high, with a boom the same length.

The rope required was 1½ in. in diameter and 1,000 ft. long.

The first log was put in place Jan. 2, and the last the latter part of March. Mr. Albright plumbed every log as it was put in place, and all his workers insisted that they had never had a more pleasant task or ever worked quite so hard. Even the carpenters came in on this, especially the "never having worked so hard." Their work, as specified by the association representative, consisted of doing the sawing and nailing. There was considerable sawing, and of a rather heavy variety, but the part of the specification which made Mr. Albright laugh was concerning the nailing. It is sufficient to state that every log, as well as the heavy oak window framing, was fastened in place by means of spikes half an inch square and 10 in. long.

By the time the logs were up, the oak-slab shingles, specially cut for the purpose in southern Indiana, had arrived. The shingling did not take long and presented no difficulties. Then Mr. Albright started out to find a material for filling up the chinks. Blue clay was recommended and a whole carload was procured from a construction company sinking a tunnel under the Chicago river. Two days' work sufficed to put the clay in place, but on the fourth day it all came down again. Blue clay, no matter how compactly pressed when wet, shrinks one-eighth in drying. This caused it to fall away from the logs or to crack badly when it stuck. Had it been mixed with two parts sand, the blue clay would have been ideal for the purpose, but Mr. Albright did not know this at the time. He substituted cement plaster, which proved perfectly satisfactory. The clay experiment cost him just \$100.

The easiest way to explain the shape of the structure is to say that it consists practically of two gable-roof log houses, 48 ft. deep by 32 ft. wide, placed side by side 20 ft. apart and connected by an intervening section. This intervening section is the main entrance and reception hall, one of the log

houses is the artist's studio, 48 ft. long by 32 ft. wide, and two stories high, and the other contains the actual living quarters. The living section has its inner walls plastered in the conventional way, and consists, on the ground floor, of a 16 by 24-ft. living room, a dining room the same size, a 12 by 18-ft. library, and a kitchen. The second story has five large bedrooms, one of which is above the entrance hall. The sun parlor is back of the reception hall and between the two gable-roof sections, and the sleeping porch is just above it.

Eventually the house is to be fur-

nished with heavy oak, carved furniture of Mr. Albright's own design. He intends employing an old wood carver in the basement for at least two years doing this work.

Mr. Albright says he could not tell for the life of him just how much his venture has cost, as he kept no accounts and paid no attention to the little sums continually going out. The only part of the work done by contract was the foundation, so he knows that this cost \$1,600. He does know, however, that the result is just what he wanted, and that the woods and children he loves are all about him.

U. S. S. "KANSAS" HAS A DIVING DOG

Among the many accomplishments accredited to the dog mascot of the U. S. S. "Kansas" is its ability as a diver. The greater number of dogs



Dog Mascot of the U. S. S. "Kansas" Diving into the Sea

taught to enter the water from piers and boats take a springing leap outward and upward, the hindquarters entering the water first. This dog dives head and forefeet first.

GAS HOLDER OF 6,000,000 CU. FT. CAPACITY

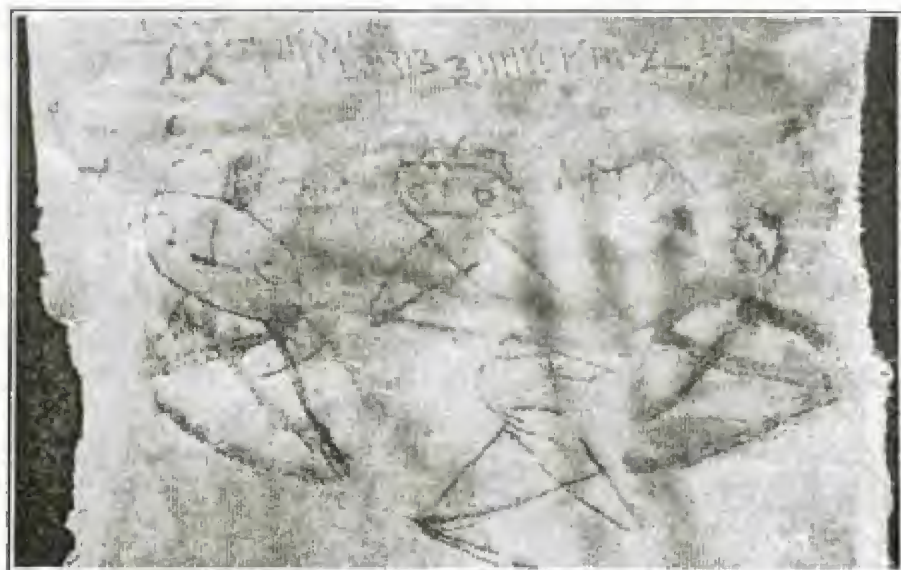
The largest gas holder in the world for the storage of natural gas will be erected in Pittsburg at a cost of \$500,000. It will be 208 ft. high, have a diameter of 226 ft., will weigh about 5,000 tons, and will have a capacity of 6,000,000 cu. ft. The steel plates for its construction are $1\frac{7}{8}$ in. thick, and more than 1,500,000 rivets, each 2 in. in diameter, will be used in putting them together.

NEW SEAPORT CONTEM- PLATED FOR ROME

Negotiations are on foot in Rome for the construction of a new seaport for that city, and it is probable that a French syndicate will build it. The place likely to be chosen is Palidoro, which is situated about 12 miles to the northwest of the city. The banks of the river at this point are more steep than at other points, which makes it easier to obtain the desired harbor depth of 30 ft. A short railroad will connect Palidoro with the railroad running between Civita Vecchia and Rome. Civita Vecchia strongly opposes the scheme because it will oust it from its present position as Rome's most important seaport.

CHILDREN'S DRAWINGS ON A MUMMY WRAPPING

That children of 2,000 or more years ago had many characteristics akin to those evinced by children of today is illustrated by this mummy wrapping



Drawings Made by Children of 2,000 Years Ago on the Wrapping of a Mummy

which bears several crude drawings accredited by archæologists to childish hands.

Mummies, according to Prof. Flinders Petrie, of the British School of Archæology in Egypt, probably stood about the dwellings for one or two generations. Then, when the foot-cases had been kicked in, when little boys at their lessons had scribbled caricatures on the toes, they were carted off to the cemetery to make room for later deaths in the family. No funeral monument or cenotaph was put over them, because they were not buried so long as there was interest in them.

Under authority of the Australian statute which corresponds to the American pure food and drug law, orders have recently been issued that methylated spirits henceforth must contain 0.5 per cent of coal-tar naphtha, which does not affect the value of the spirits but makes them unpalatable for drinking purposes, and will thus check the sale of such liquids as substitutes for ordinary alcoholic drinks.

SILICA FOR STANDARDS OF LENGTH

Instead of using gold or platinum bars on which to mark the official standards of length, as of the yard or meter, a British scientist proposes to use silica, which is practically the same as ordinary sand.

Metals have usually the property of expanding or contracting with changes in temperature, and gold and platinum are no exception to the general rule. There is a metal called "invar," a nickel-steel alloy containing 36 per cent of nickel, which preserves nearly invariable dimensions under ordinary temperature changes—hence its name.

But invar has other physical properties which render it unsuitable for standard measures.

A silica length standard was recently constructed in England, and showed to advantage under temperature tests, as its expansion per degree Centigrade rise of temperature proved to be but one-twentieth that of platinum-iridium alloy which has hitherto been considered to be the best material to use for length standards.

The present model, which is the first of its kind, consists of a silica tube into the ends of which are fused plane parallel slabs of transparent silica. The under sides of these slabs are covered with a platinum deposit which is cut through with a ruling diamond at the transverse lines defining the standard meter. These lines, which are beautifully clean-edged, are viewed through the slabs from above, and are thus seen to advantage.

The Russian military authorities have announced their intention of buying 2,000 motor trucks of a capacity of from 1½ to 3 tons, for use in the army.



The "Demoiselle," Santos-Dumont's Tiny Aeroplane, Equipped with Rotary Motor

ROTARY MOTOR ON THE "DEMOISELLE"

After a year of experimenting, the "Demoiselle," which since its invention by Santos-Dumont has retained the distinction of being the smallest and lightest of aeroplanes, has been successfully fitted with a Gnome rotary motor, and Messrs. Audemars and

Garros, the French airmen who have made many flights with the tiny flyer, declare it is a big improvement over the two-cylinder, horizontal opposed motor with which it has been equipped. The extreme lightness of the bamboo framework for a time made it seem impossible to use the rotary type of motor, but by strengthening the upper parts, it has been accomplished.



The Gnome Motor Fitted on "Demoiselle" for First Time, Replacing Horizontal Opposed Motor

DISCUSSION OF CHANNEL TUNNEL IS REVIVED

Considerable attention has been given lately in engineering publications to the long discussed question of tunneling the English channel. The election of Lord Kitchener to the directorate of one of the English railways revived the matter although the famous British soldier has never given public expression of his ideas in the premises. It is regarded as highly probable that the matter will be seriously considered within the course of the next few years, however, especially in view of the fact that such opposition as has hitherto existed, based upon the military menace to Great Britain such a tunnel would hold, has been entirely dissipated through the arguments of those in favor of the tunnel to the effect that an invading force could easily be stopped and engulfed by the use of a few sticks of dynamite.



Preparing to Descend through Ledge in Unique Elevator

CRUDE ELEVATOR A MONEY-MAKING ATTRACTION

As an example of primitive mechanics the crude elevator at Chain Mill Falls, near Hanover, Ind., and high up in the "knobs" on the north side of the Ohio river, is unique. As shown in



At the Bottom of the Shaft under the Ledge

the two pictures the elevator drops through the ledge of rock, over which the water falls, and is intended to carry sightseers down into the cavern behind the waterfall.

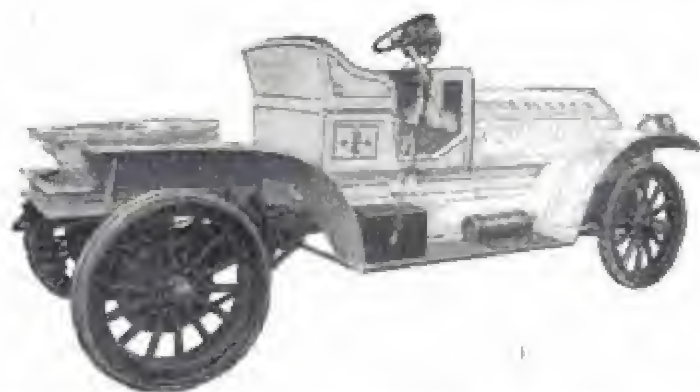
Fifty years ago a pioneer established a flour mill on the site of the upper picture. He bored a hole through 80 ft. of rock and swung a chain with buckets through it. He persuaded the six or ten cubic feet of water per minute which flows there to drop into these buckets and turn his mill wheels, thus giving the falls their name.

Long ago the dam washed out and the mill and its chain gear disappeared and until this year there was nothing there except a big hole through the rock which was gradually growing over with vines. The scenery at the point is wild and picturesque, and a new tenant on the farm conceived the idea of establishing a small amusement park with the improvised elevator as the principal attraction. College students from Hanover are the chief patrons.

The crude elevator is balanced by weights. In order that it may be sent down without a load, the inventor has provided it with a large water tank. A portion of the stream is diverted into the tank and down goes the car to the bottom, without a brake or any stoppage. The college students or others who have been beneath the falls may then get up by pulling out the plug in the tank and waiting until the tank on the weights is full enough to bring them up. The only braking device used is a stick which is applied to the pulley. Two is a good load for the car.

Surplus water runs into the barrel shown at the bottom of the rock ledge under the falls. If it becomes necessary to fill the tank on the weights a siphon from the barrel is used.

Hydraulic engineers who visited the spot recently found that by means of a dam and a pipe line a total "head" of 200 ft. could be obtained. This would be sufficient to operate a small generator which would not only run the ele-



Motor Car Designed for the Conversion of Horse-Drawn Fire Apparatus into Motor-Propelled Apparatus



Ordinary Automobile Used in Converting Horse-Drawn Fire Engine into Motor-Driven Machine

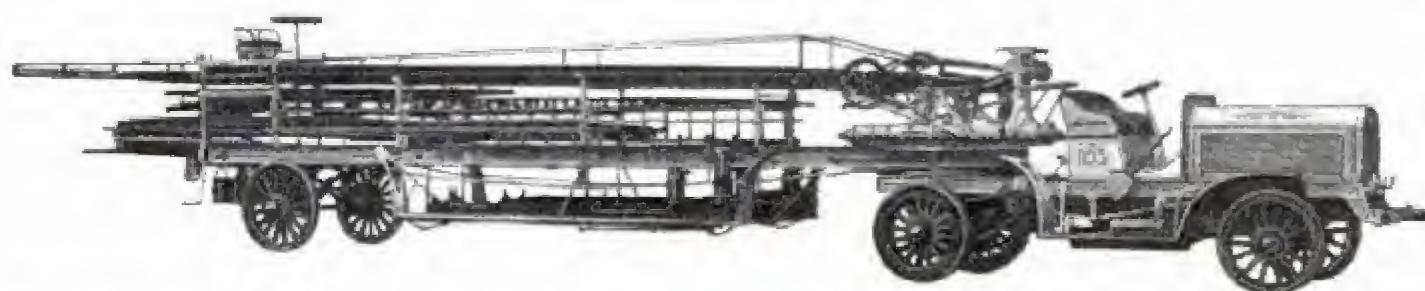
vator with less danger to life and limb, but would also light the farmer's house and his amusement park. But the present tenant is perfectly satisfied with the homemade elevator, probably because it is such an unusual piece of mechanical engineering that it draws many visitors, all of whom are charged for the privilege of riding on it, if they have the courage to tackle it.

FIRE APPARATUS DRAWN BY MOTOR OR HORSES

The hesitancy of many cities when the question of motor-propelled fire apparatus is raised is due in part to the cost of installing completely new apparatus. One motor company, at least, has attempted to overcome this objection in the ingenious manner shown in the accompanying illustrations. Instead of the city buying a complete motor-driven hook-and-ladder truck, service truck, or fire engine, it may purchase from this company a motor car built along the lines of the ordinary touring car, but especially constructed and equipped to be quickly

substituted for the forward truck of the ordinary horse-drawn vehicle. Thus the horse-drawn apparatus may be changed over for motor propulsion without taking it out of service, the cost is much less than that of a complete new vehicle, and should the necessity arise the change back to a horse-drawn vehicle can be quickly made.

That an ordinary automobile may be used in the same manner is shown in the illustration of a converted fire engine. The front wheels and the tongue of this fire engine were removed, and it was mounted on the chassis of a 40-hp. car. A hanger bar with a ball joint was used as a mounting for the engine on the automobile chassis, and springs serve as cushions to break the impact, on the same principle as is worked out on railroad trains. The arrangement is a temporary one of the Bridgeport, Conn., fire department, and was utilized because there was no place for the horses while repairs were being made to the stables of one of the fire houses. The equipment has a speed of 35 miles an hour.



The Substitution of the Specially Designed Motor Car for the Ordinary Forward Truck of This Aerial Converts It into a Six-Wheeled Motor-Propelled Vehicle



The "Ice Stove"



Professor Bell's Residence

"ICE STOVE," PROFESSOR ALEXANDER GRAHAM BELL'S LATEST INVENTION

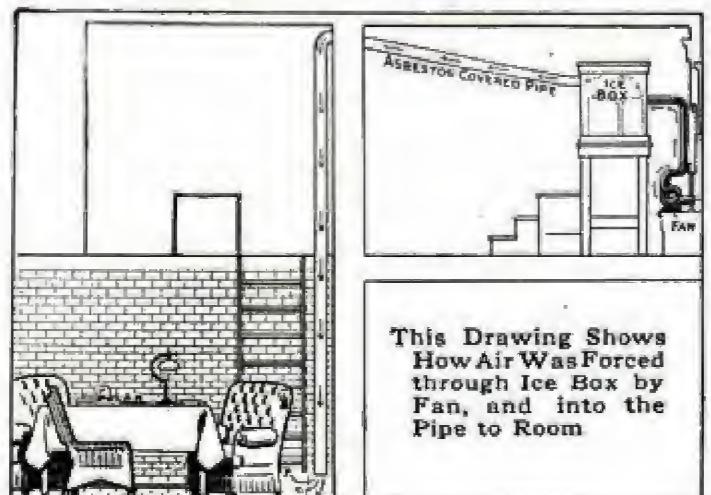
Prof. Alexander Graham Bell, inventor of the telephone and scientist of world-wide fame, has recently invented and constructed an apparatus for cooling dwelling houses in summer at small cost and with simple operation, which has been used with much success in the inventor's home in Washington, D. C., during the hot spells of the summer.

While other dwellers on aristocratic Connecticut avenue in that city sweltered and wilted under the torrid temperature that, even within doors of the mansions of that wealthy locality, rose daily to 90 deg., Professor Bell sat comfortably at work in his study. On his desk the thermometer, throughout the whole summer, has never registered higher than 61 deg.

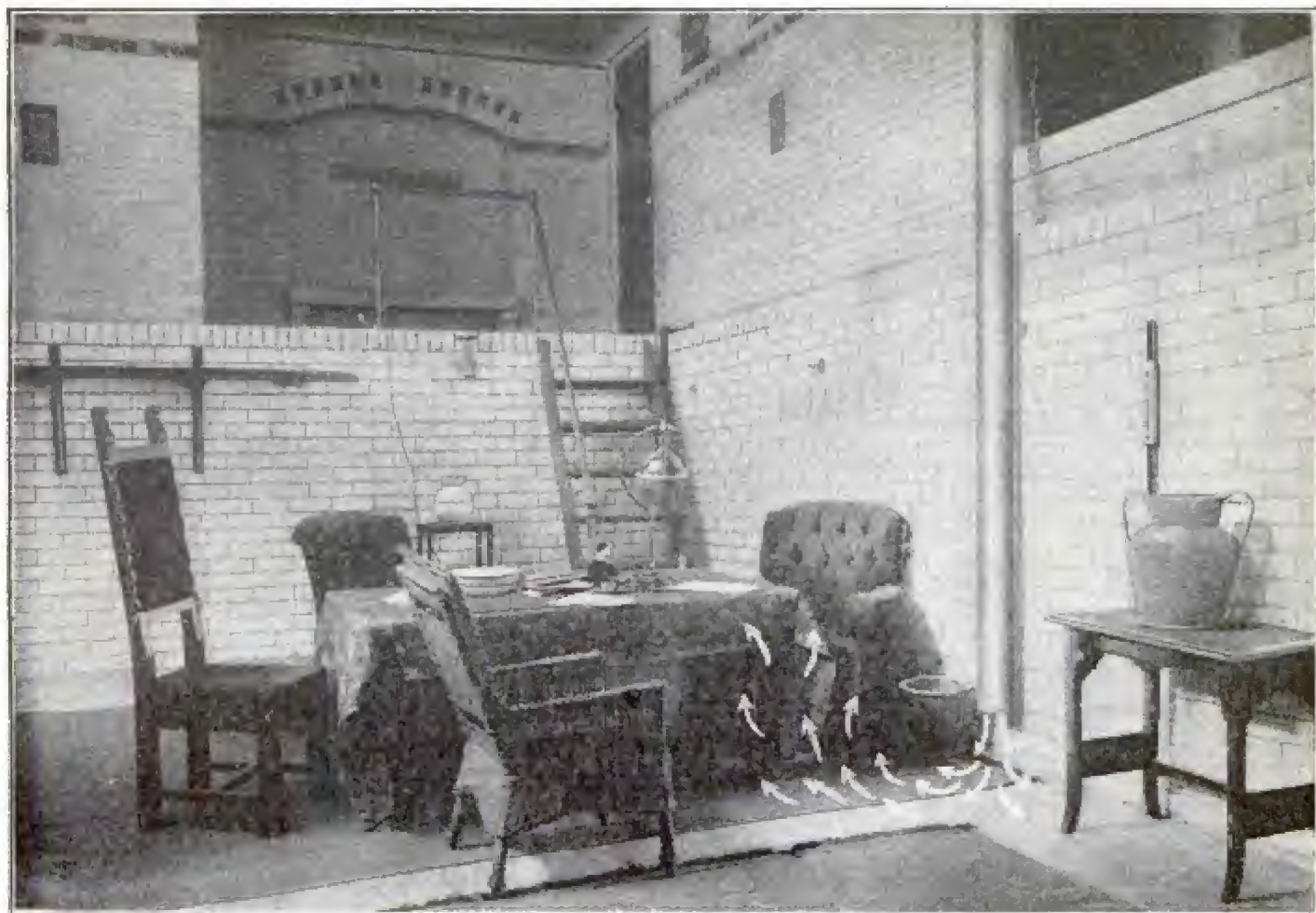
While there are numberless appliances for cooling buildings, they are, for the most part, adapted only to large structures and are of a costly and complicated nature, dependent upon involved mechanism and many-syllabled chemicals, requiring an expert to op-

erate. Professor Bell's latest invention avoids all these objections.

He first became interested in the subject during a recent tour of the world, being much impressed in India and other tropical countries with the total absence in the dwelling houses, even of the wealthy classes, of all means of tempering the fierce heat. When he returned to the United States he at once addressed his talents to devising an apparatus that, while avoiding the objections of high cost and complex operation, would yet achieve satisfac-



This Drawing Shows How Air Was Forced through Ice Box by Fan, and into the Pipe to Room



Study, Formerly a Swimming Tank, in Professor Bell's Washington Home in Which Thermometer Never Went Above 61 Degrees During the Summer. Cold-Air Pipe, Ending Near Floor, is Shown on Right

tory results in the cooling of private dwellings. With characteristic energy he soon conceived and constructed an appliance which, he thought, would fill the requirements. Nature aided him, for hardly had he installed this latest creation of his genius when a series of blistering hot spells put it to a crucial test.

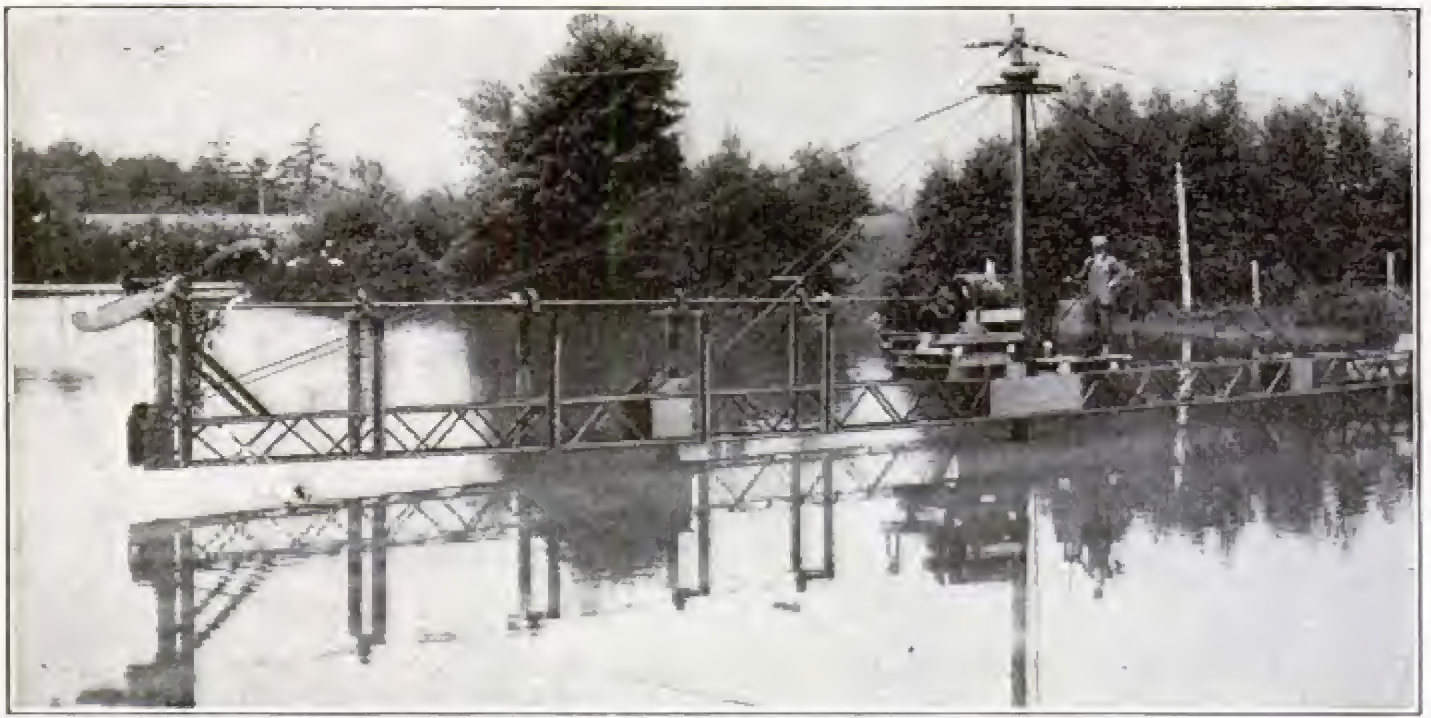
This is the method of constructing the "ice stove," as it is now installed in Professor Bell's home in Washington:

On the window ledge is set a small fan, about 6 in. in diameter. It is operated by a small electric motor attached by a wire to an electric-light socket. The fan is inclosed in a casing. Under the lower sash of the window is set a board in which is a $2\frac{1}{2}$ -in. hole. A short pipe connects this hole with the encased fan, thus supplying pure air from outdoors. Another pipe runs from the fan casing to a large wooden box, which formerly served as a pantry ice box, about 3 ft. high and broad, and about 4 ft. long. In this box are cakes of ice. The lid fits with

air-tight snugness. From the opposite side of the box at which the pipe from the fan enters, another pipe leads off to the apartments to be cooled in just the same manner that hot-air pipes lead from a heating furnace. This pipe is heavily encased in asbestos. When this service pipe comes through the wall into the room to be cooled, it runs down to within about 3 in. of the floor, the end being open for the discharge of the cold air.

All that is necessary to cool the room is to turn on the electric current and start the fan. This draws the air in through the window pipe and drives it through the connecting pipe into the ice box. Here the pressure of the air from behind, due to the driving power of the fan, forces it across the ice, thereby cooling it, and thence on into and through the service pipe, whence it is discharged into the room.

While Professor Bell uses electricity as the most convenient method for operating his fan, any other motive power would be equally good.



Whirling Table of the Worcester Polytechnic Institute for Testing Aeroplane Propellers

AN AERIAL PROPELLER TESTING STATION

An experimental station for carrying out a long series of tests of aeroplane propellers has been established at the Worcester Polytechnic Institute, Worcester, Mass. The apparatus was designed by David L. Gallup, assistant professor of gas engineering, and some results of real scientific value are being secured with it.

As a basis Professor Gallup took an apparatus which has been used in testing current meters. A large shaft is imbedded in a boulder in the bottom of the lake which supplies water to the hydraulic plant. At the top of this shaft is a heavy boom, 84 ft. in length, which swings in a circle of 42 ft. radius, making a circumference of nearly 264 ft.

The propeller is mounted on one end of this boom, its axis being tangent to the circumference at that point, and is driven by a 75-hp. variable-speed motor located at the center of the boom. At the present time the boom is turned on its axis by the action of the thrust exerted by the propeller, but later a supplementary motor will be installed which will drive the boom at a speed up to at least 60 miles per hour at the tip. The tip

speed of the boom or the velocity of the propeller through the air is measured by means of a delicate electrical arrangement and is checked by a speedometer which shows the speed in miles per hour.

Tests are to be run on various makes of propellers, determining the relation between "standing" thrust and "moving" thrust. That is to say, the propeller is to be anchored and the thrusts obtained for various speeds of rotation of the propeller. Then the propeller is to be operated at a definite number of revolutions per minute, say 1,500, and various drags placed on the boom so that the speed of the propeller through the air will vary from 10 to 60 miles per hour. The propeller will next be run at 1,400 revolutions per minute and a sufficient drag placed on the boom to allow the propeller to go through the air at various rates of speed, and similarly for 1,300, 1,200, 1,100 revolutions per minute, etc. Of course this performance will be varied in detail on account of varying pitches and diameters of the propellers which are undergoing test, but the instance cited serves as an illustration of the work.

"PUMPING" TAXIMETERS

One of the tricks of the taxi-drivers' trade was described before one of the Paris police courts recently when three chauffeurs were accused of attempting to defraud. It appears that by gently hitting the meter with the hand or manipulating the metal flag, it is possible to make the "prix à payer" mount up without the extra sum thus registered showing on the day's receipts.

A few days ago, three drivers, while waiting outside a church for the passengers they had brought there, "pumped" the meters. Before the people came out one of the meters had registered 146 francs. The drivers seeing that they had gone too far endeavored, by hitting and shaking the meter, to reduce the amounts. They only succeeded in breaking the machines entirely.

EMERGENCY DOOR LOCK

A lock that can be carried in the pocket and may be applied to any door, enabling the user to secure the door against all other persons by a lock controlled exclusively by himself, has been especially designed for travelers.



Door Closed, Showing Lock Applied to Slide, in Which Position it Prevents Opening of Door

The device consists of a slide which hooks into the strike or keeper on the door jamb, and a cylinder lock which engages with the slide and prevents the door from opening when in place.

A person provided with such a lock may secure any room, closet, or wardrobe against sneak thieves and against persons having duplicate keys. It is particularly desirable where doors are fitted with insecure locks or when keys are lost.



Door Open, Showing Slide and Bolt in Position

HIGH PRICE OF PLATINUM DUE TO MONOPOLY

The high price of platinum, which has risen from about \$100 a pound to nearly \$730 per pound at the present time, is not altogether due to its scarcity, but also to the fact that almost the whole world's supply comes from the deposits in the Ural mountains and that this supply is completely controlled by two men. These men are Prince Demidoff and Count Schuwaloff, who fix the price to suit themselves.

Three British submarine boats recently completed a voyage of 9,000 miles from Portsmouth, England, to Hongkong, China.

INTERESTING FANCY OF AIR OWNERSHIP

The problem of ownership of the air, which will have to be faced by the lawmakers of the different nations before air navigation grows much older,



A Piece of Land Includes the Earth Below to Its Center and the Air Above

brings up the question of how much air space each land owner might be able to lay claim upon. According to the London Sphere, it is evident that fences, walls, and so forth, are all built to lines diverging, and plumb to the earth's center. Theoretically, therefore, it may be said, in passing, a house is wider at the top than at the bottom. Thus a piece of landed estate is in the form of an immense inverted pyramid, having its apex at the earth's center and its base anywhere from the earth's surface to any given distance above. The higher the distance, the larger in extent is the air space allotted to a given space on the earth's surface until, if the idea be carried far enough upward, the moon and other heavenly bodies become trespassers.

INDESTRUCTIBLE LABELS FOR NURSERYMEN

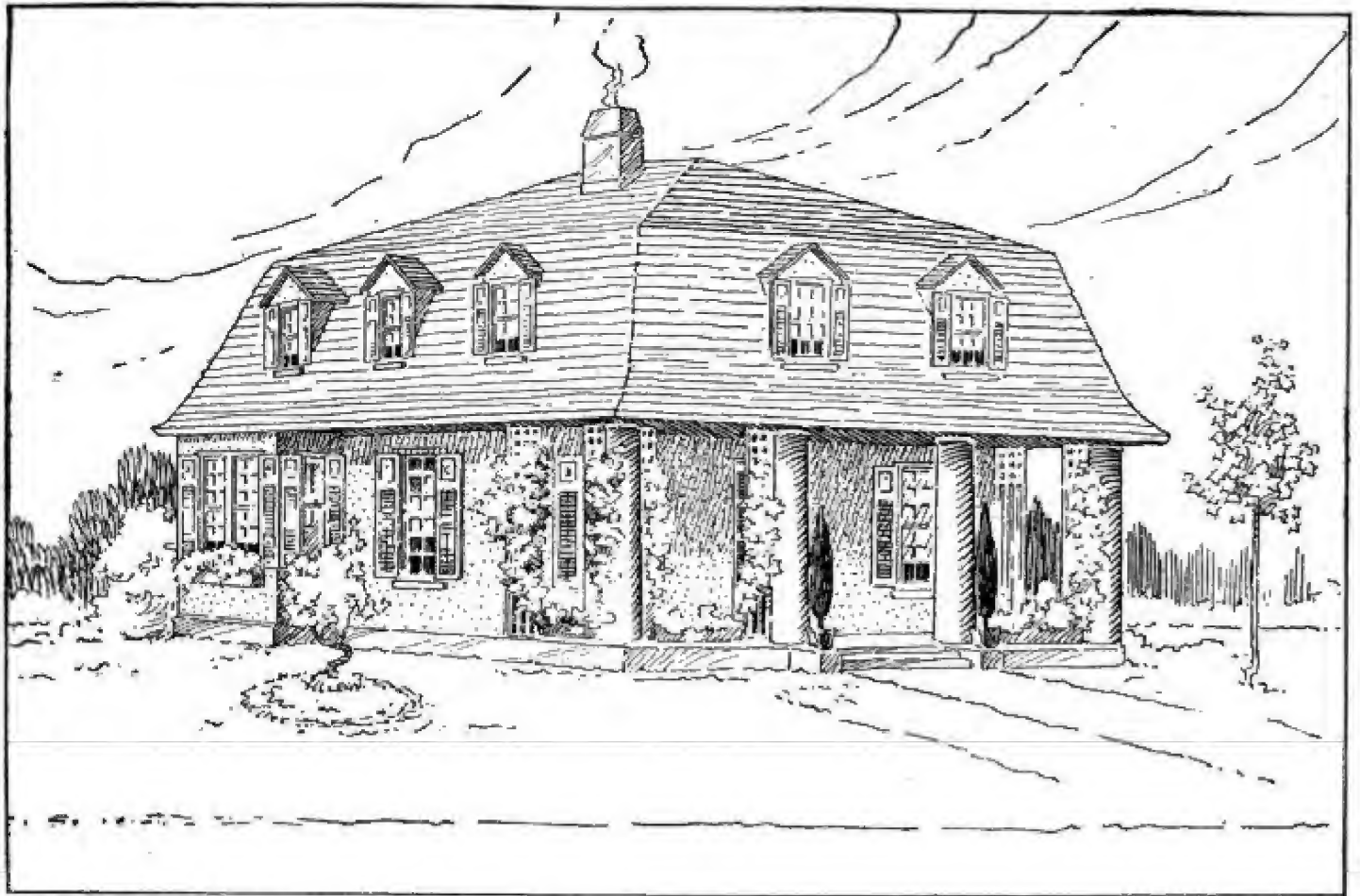
An indestructible label, said by the French scientific magazine "La Nature," to be the simplest and most practical device of the kind on the market for nurserymen, is now being sold by a Paris firm. The label consists of a very thin malleable sheet of a bronze alloy, perforated at one end for the insertion of a wire with which to attach it to the plant. Laid on a folded newspaper or other similar soft surface, the name of the plant and other data can be easily inscribed upon the metal by means of a nail or even a hard lead pencil.

BILLBOARD ADVERTISING DEVICE ON WHEELS

A familiar sight in the streets of Geneva, Switzerland, is the traveling billboard which contains theatrical and other forms of advertisement. The billboard is really a cylinder about 10 ft. high and 3 ft. in diameter, mounted on a low four-wheel truck. The cylinder revolves slowly as the truck is pulled through the streets by hand. Usually it is topped with a pyramid painted with stars to resemble the heavens, and over this is set a grotesque head.

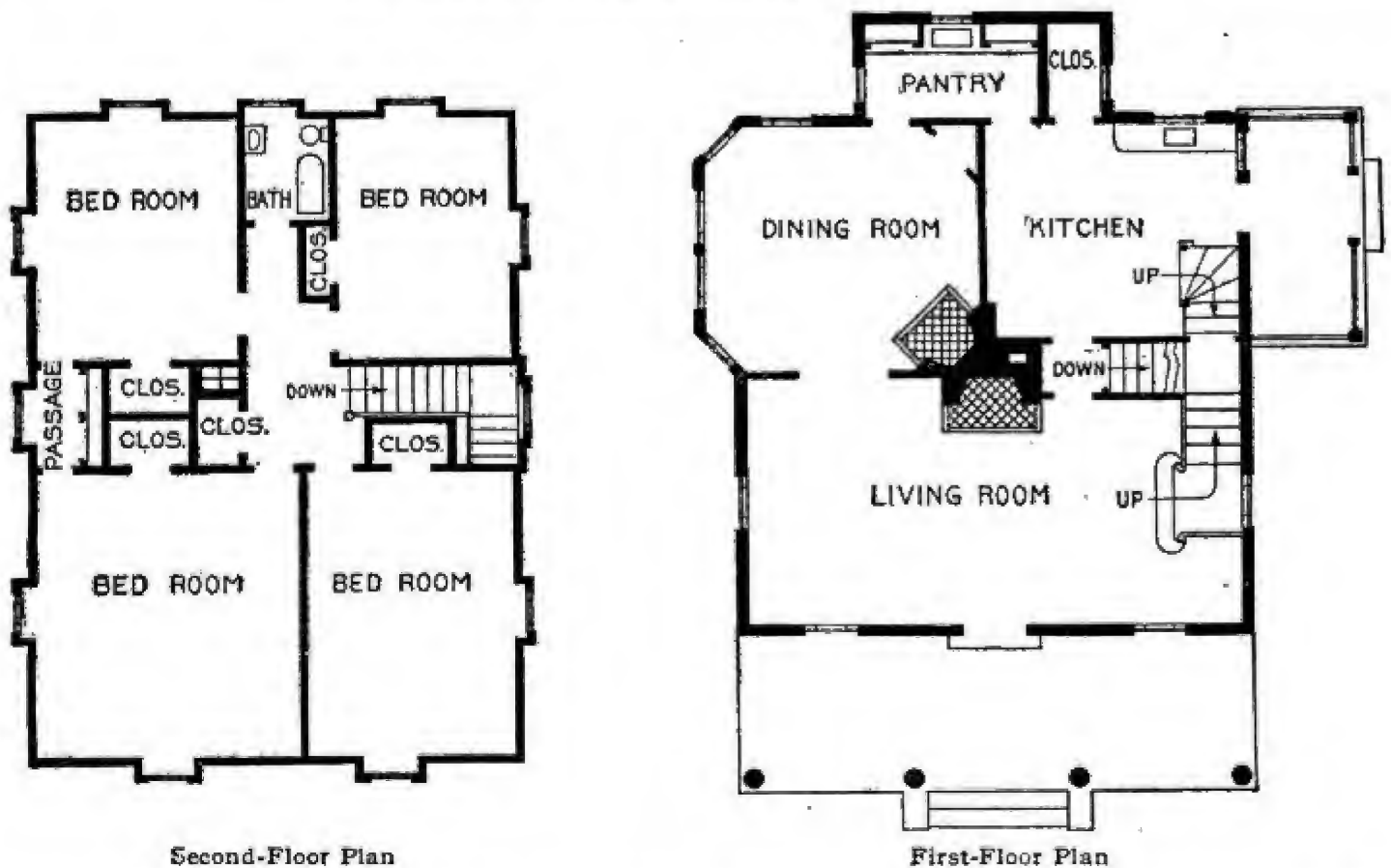


Traveling Billboard Used in Geneva, Switzerland



William F. Leppin, Architect

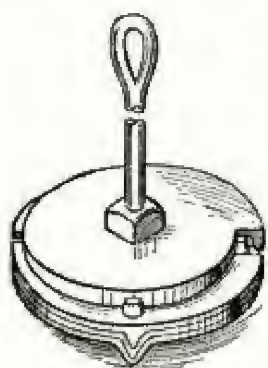
Front Elevation of the \$4,500 Concrete and Shingle Cottage



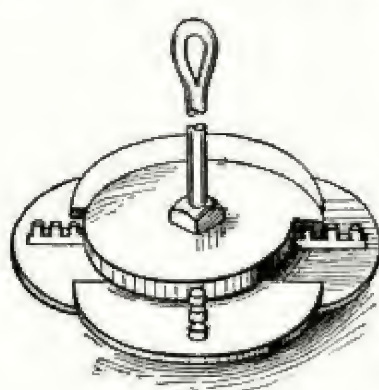
A solid and substantial building, suggestive of the farm and field, though designed for a suburban home, is represented in the accompanying \$4,500 house plan. Seven rooms are provided for in the architect's sketches. The design of the house is a modification of the colonial type, built of concrete and shingle or slate. There are four bedrooms on the second floor, and the living room and dining room are not only large, but provision has been made for exceptional lighting. The entire plan is regarded as unusually interesting because of its ready adaptability to a variety of locations. The house plan published in Popular Mechanics Magazine for August was drawn by James W. O'Connor of New York and was one of the prize-winning designs in the Building Employers' Association competition.

AN EXPANDING ANCHOR

A ground anchor of the expanding type and so strong in its grip that it is said its solid steel rod will break



The Expanding Anchor Closed



The Anchor Fully Expanded

before the anchor will pull up, has recently been devised and put on the market. The hole for the anchor is bored in the round by a tool known as a "deflector," which makes an aperture which increases with the depth. The closed anchor is dropped into this hole and expanded by a special kind of wrench which turns the square nut at the bottom of the anchor shank.

WEIGHS THREE MATERIALS AT ONE TIME

A novelty in weighing machines is known as a "triplet," as it weighs three different materials at one time, automatically. This simultaneous weighing, which is correct to within 1 per cent, is of especial use in the proportioning of materials for mixing, such as cement, sand and gravel for concrete.

The material is fed to the different buckets by means of small traveling conveyors, and as each bucket is filled to the amount required for a balance, its conveyor is automatically stopped and the supply of material cut off. Then, when all three buckets are filled, they are

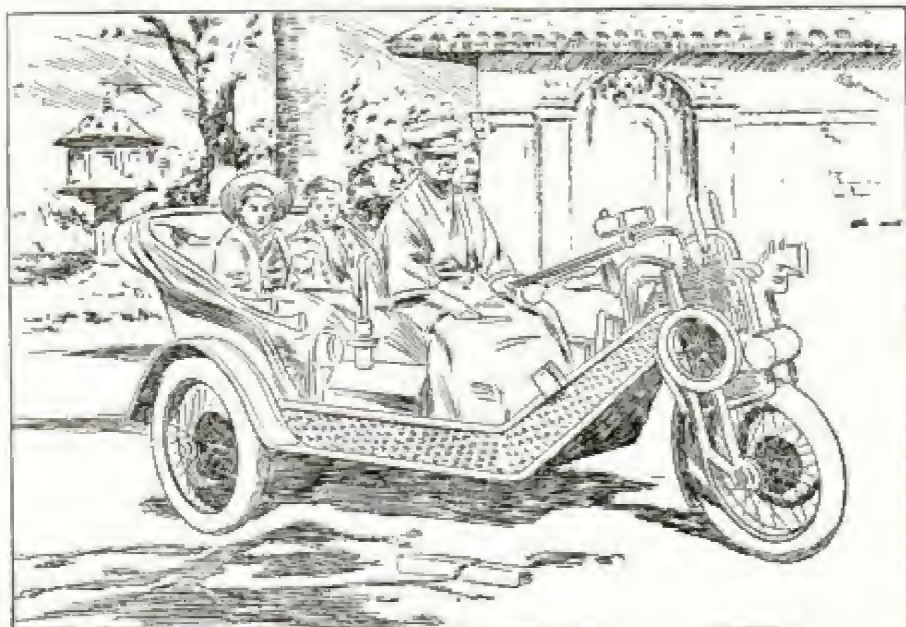
simultaneously dumped, and the process is repeated. From two to three discharges of the buckets can be made per minute, according to the materials handled. A counting device can be attached to the machine so as to register the total number of weighings in a given period.

AUTOMOBILE WIRELESS FOR ARMY USE

A self-propelled wireless outfit, in which the gasoline engine of the carrying automobile may be used to drive the vehicle or to operate the electric generator for running the wireless telegraph apparatus, has recently been constructed for the military railway and telegraph corps of the Austrian army. The car is a special 28-32 hp. chain-driven machine, and has a roof designed to carry the 98-ft. telescopic mast of the wireless apparatus. It has a speed of 25 miles per hour and accommodations for six persons and a chauffeur.

THE MOTORETTE OF A JAPANESE NOBLE

One of the most curious motor vehicles in Japan is the three-seated motorette of Count Yanagisawa. It



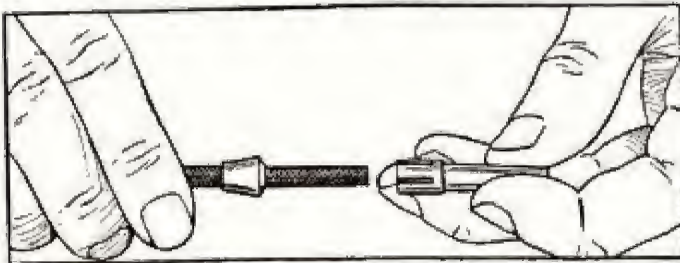
Motor Vehicle Owned by a Japanese Nobleman

has a set of wheels at the back and a single wheel in front, and the complete power plant, gasoline tank and all, is mounted over the front wheel, which is the drive wheel as well as the steering wheel.

A SAFETY MINING CAP

Misfires in mine blasting are said to be impossible with this mining cap, which is of simple construction and designed to prevent any moisture whatever from getting into the fulminate which explodes the blasting charge when it is detonated by the heat of the burning fuse.

The fulminate is contained in the lower part of the cap, which fits tightly

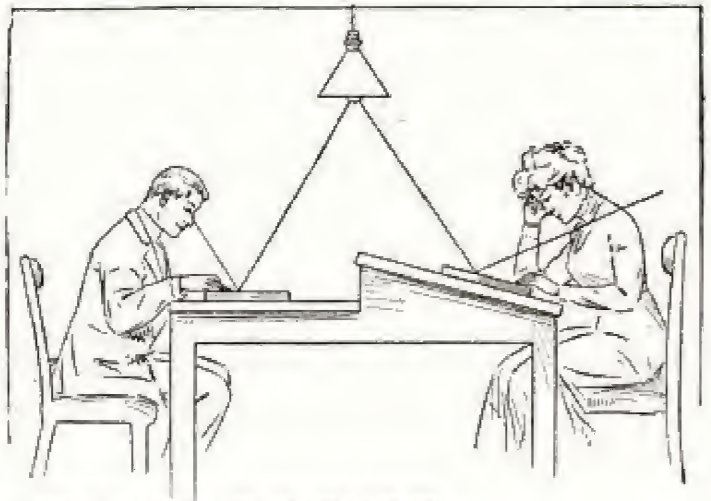


Placing the Safety Mining Cap on a Piece of Fuse

over the fuse. The upper end has an expanded portion which fits over this, and ingress of moisture is prevented by a rubber sleeve and a special waterproof preparation. Longitudinal slits in the expanded end permit of the necessary expansion of the upper part of the device when it is forced over the lower part. The illustration shows the simplicity of the device in use.

SLANTING DESK SAVES THE EYES

How a desk should be slanted in relation to a source of light so that the glare from the surface of the printed page or the paper on which a student is writing will not strike the eyes is shown in the accompanying illustration, along with an improperly arranged desk. The man at work at the flat-topped part of the desk will suffer eye-strain because of the glare which enters his eye directly, while the young woman



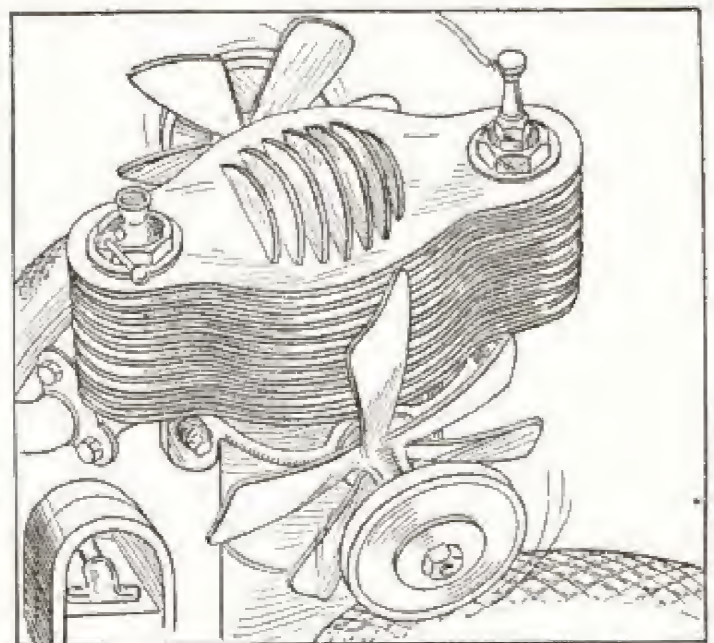
Courtesy Optical Journal and Review

The Flat-Top Desk Causes Glare to Strike the Eye, while the Inclined Desk Prevents Direct Glare

will escape this trouble, the course of the light ray, after striking the book, being considerably below the eye.

MOTORETTE ENGINE WITH TWO FLYWHEELS

The little 6-hp. engine of a new British motorette, the name given the three-wheeled type of machine which is a cross between a motor runabout and a motorcycle, has two external flywheels with two frictionally driven fans attached. One of these machines made a run of 330 miles in 20 hours after just being assembled, which would be considered in the nature of a remarkable performance for any kind of machine.



Frictionally Driven Fans and the Two External Flywheels of a 6-Hp., Air-Cooled Motorette Engine

DO WE REALLY LIVE IN THREE DIMENSIONS?

By HARRY ENGLISH

Do material things, as we know them in this world, really have length, breadth and thickness, or do we only think they do?

The question is a fairly old one. Geometers and psychologists have argued it over with all the skill possible for finite minds dealing with the works of an Infinite Being, but up to quite recently they have only had theories and comparisons upon which to work. We are all conscious, more or less, of certain emotions, and in lieu of any positive information to the contrary, we have been content to refer these to the "five senses" — sight, hearing, smell, taste, and touch.

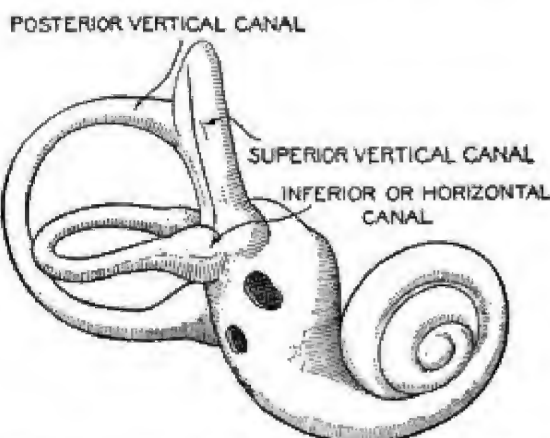
What is claimed to be a real "sixth sense" — real in so far that it has been demonstrated by actual experiments—is the "sense of space and time" which has just been announced by E. de Cyon, a celebrated Russian physiologist, after nearly 40 years of painstaking research. This "sense" gives us our conception of time and space, and limits our perceptions so that, willy nilly, we are bound to regard space as having three dimensions, those of length, breadth and thickness.

The location or the cause of this sense is in the internal ear, or particularly the so-called semicircular canals of that anatomical organ. There are three of these canals, arranged in three directions approximately at right angles to each other. They are called the anterior vertical, the posterior vertical, and the horizontal canal, respectively, and each of them receives sensations corresponding to a particular

one of the three dimensions of space, that is, of length, breadth or thickness, as the case may be. Upon the intensity of these sensations depends the intensity of the resulting nerve-reactions which convey the corresponding impressions to the brain, which thereupon promotes a certain train of thought, of reflection and abstraction, giving us the perception of length, breadth and thickness. The semicircular canals of the internal ear thus classify the three principal directions of space as sensations are transmitted from the auditory canal.

The investigations which led up to these important discoveries included experiments on animals and observations of certain malformations occurring in nature. When one,

two, or all three of the semicircular canals in the internal ear of an animal had been removed, it was observed that the movements of the animal were disorganized in consequence and in a way that corresponded to the direction function of the missing part. Thus a frog which had its horizontal canal taken away, lost its sense of equilibrium, and gyrated around on its longitudinal axis while it swam in the water, or went around in circles. When the anterior vertical canal of a frog was removed, the amphibian swam straight forward without turning, and indulged in convulsive jumps. A frog from which the posterior vertical canal was separated, assumed a vertical position in the water and began to spin around on its longitudinal axis. Similar results were obtained with pigeons and rabbits.



Structure of the Internal Ear Showing Relative Position of the Semicircular Canals



Sectional View Showing the Relation of the Internal Ear to the External Ear

A confirmation of these experimental results was obtained by observations of certain animals which nature has provided with only one or two canals. The lamprey and the so-called "dancing mouse," a Japanese rodent, are examples. This mouse has only one fully developed canal, the others being rudimentary. It behaves as if it did not possess all of the space conceptions of the normal animal. Thus it seems to be incapable of walking straight ahead, moving diagonally instead, or in curved paths. Its most peculiar characteristic is that of spinning around and around as if dancing, frequently for hours at a time.

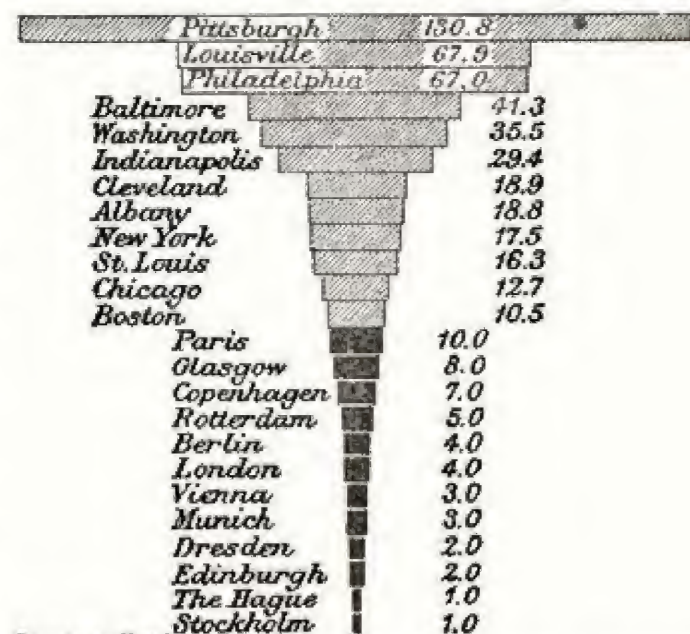
While these researches do not prove that we do not live in three-dimensional space, they show that our conceptions of space as possessing three fundamental directions are due to these so-called canals in the internal ear, and that if these organs are modified the sense of directional, areal and volumetric space is changed accordingly. Possibly some future experiments may yet indicate the existence of a fourth or higher dimension of space, such as has already been conceived theoretically by men of science.

AEROPLANE RANGERS FOR FOREST RESERVES

The supervisor of the Selway forest, consisting of 1,600,000 acres which was formerly part of the Nez Perces reserve in Idaho, predicts that aeroplanes and wireless telegraphy will be important factors in forest-fire prevention before a far distant date. He believes that a man in an aeroplane could do more accurate and extensive survey work in the forests of the Pacific slope country in a few hours when forest fires are raging than is usually accomplished by 20 rangers in a week. With wireless stations installed on peaks in the chief danger zones, he believes it would be a comparatively easy task to assemble men and apparatus to check and extinguish the flames and prevent spreading.

TYPHOID DEATH RATE OF AMERICA AND EUROPE

The typhoid death rate per 100,000 population of the cities of the United States, according to the accompanying

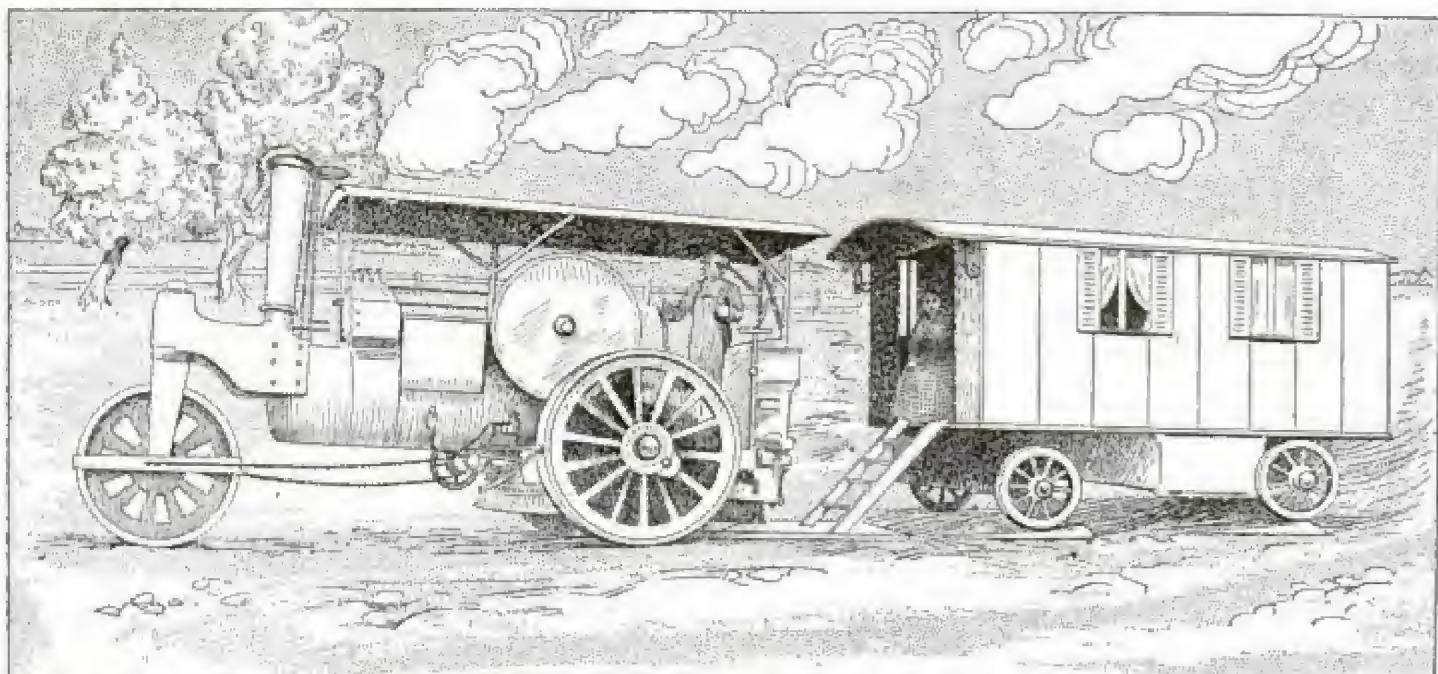


Courtesy Engineering

Twelve American Cities Head This Table of Typhoid Death Rates

table compiled by H. de B. Parsons, for an English publication, is far in advance of that of European cities, even though the water supply of the European cities is considered bad from a European standpoint. Pittsburgh, for instance, according to this table, has the enormous typhoid death rate of 130 per 100,000 of its population, as against four in London, two in Edinburgh, and one in Stockholm.

"See Naples and die" is an adage which may be applied to many American cities with as much reason as to the Italian city whose beauty and unhealthiness are alike proverbial. No matter how risky water drinking may be on the Continent, it seems to be much more dangerous in many cities of the United States, the 12 cities heading those listed in the typhoid death-rate table being all American. Dangers to health and life are accepted far more readily than they are in the older countries, and small variations in the death rate attract but little attention. Then, too, in the Latin countries of Europe, a light inexpensive wine is used by even the poorer classes in place of water, which may have something to do with low typhoid death rates.



A French Road-Mender's Outfit and the Wheeled House in Which He Moves His Family About with Him

FRENCH ROAD-MENDERS LIVE ON THE ROAD

Many of the French road-makers and repairers live on the road during the six or seven months of the year they are at work. The driver of this road roller carries his family along in the caravan shown. When one road has been repaired, he moves along to the next, dragging his wheeled house behind.

BALLOON-SHAPED SUNSHADES

The new sunshades now coming into use in Paris and London when small hats are worn are called "balloon sunshades," because they resemble the



One of the Balloon Sunshades Designed to be Used When Small Hats are Worn

top of a balloon the bottom half of which has been cut away. They are being made in all colors and shades, and have four more ribs than the ordinary sunshade.

SOME UNUSUAL RAILROAD WATER-STORAGE TANKS

In the construction of a water-storage tank recently by the San Pedro, Los Angeles and Salt Lake Railway, the company took advantage of the topography of the country in a somewhat unusual way. About 400 ft. above the track level was a mass of conglomerate (closely packed gravel or shingle in a matrix of sand). A reservoir of 150,000 gal. capacity was excavated in this rock, lined with rich concrete to prevent leakage, and roofed over. A small drift was driven upward to the bottom of the tank, and a pipe laid in it to supply a standpipe alongside the track. The cost was about one-half of that for a standard steel water tank of the same capacity.

The same railroad recently built an emergency tank of 300,000 gal. capacity at another point, by excavating a reservoir in dolomite rock in the hills about two miles from the track, and cementing and roofing it over as in the other case. This tank was fitted with automatic control.

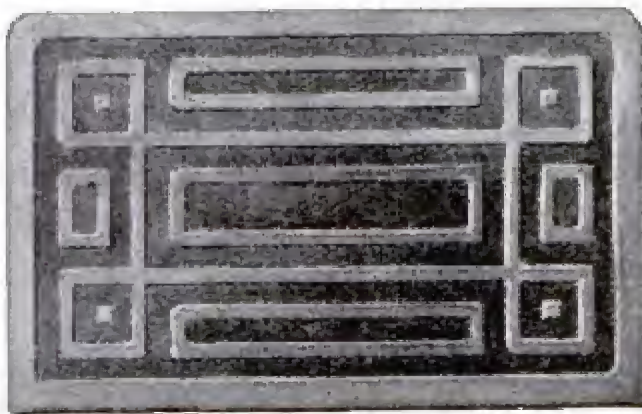
PART I—BOOK ENDS

There is practically no end to the number of useful and decorative articles that can be made of brass and copper, finished with a variety of designs and effects. It is an ideal pastime, which can be made a source of profit, training the hands in skillful work as well as developing originality and producing beautiful objects. Succeeding articles will describe how to make desk sets, blotting-pad corners, paper knives and letter openers, stationery rack, rocking blotter, desk calendars, match boxes, tie and pipe racks, whisk broom holder, candle sconce, arts and crafts jewelry, brooches, hatpins, tie pins and cuff buttons, desk clocks, hinges and drawer pulls.

IT is the intent of this and several succeeding articles to point out a few of the many artistic possibilities of brass etching that render this gentle art one of the most fascinating and least expensive of hobbies. It is fascinating because the field is almost without limit. Book ends, on which are etched attractive designs or favorite quotations; desk sets, comprising the blotter corners, stationery rack, calendar and paper knife, all etched with the same motif; arts-and-crafts jewelry, such as hatpins and watch fobs; pipe and tie racks and match holders, not to mention the many plain hammered brass and copper pieces that may be

purchased and etched in all manner of pretty designs, are among the many practical and attractive possibilities.

This art is fascinating because it affords the worker every opportunity for the display of original talent in working out new designs, and those to be illustrated in this series have been selected not so much on account of any particular artistic merit, but because they are suitable for the amateur, and serve to clearly set forth the method involved. And unless we may hope to so instruct the reader that he or she will be able to apply these methods to the carrying out of new ideas and designs, our efforts, we feel,



Conventional Designs for Book Ends — The Lower Design Requires Considerable Hammer Work, as the Outer Edge is Bent Over and Hammered Down Around the Top and Sides, and the Center Portion is Beaten Out

Designs for Book Ends Which Give an Idea of the Possibilities for Originality of Treatment, Adding Fascination to the Work of Making Useful and Ornamental Articles for the Home

will have been in vain. For a great many, there is undoubtedly much pleasure in working with the hands; but, when the thing made is the product of one's own originality, this pleasure is doubled.

Not only is our subject truly interesting, but the work inexpensive to carry on and does not require much space. Any convenient nook or corner where may be kept a few jars or trays of glass or crockery, a bottle of nitric acid, a small can of asphaltum paint and two or three brushes, is about all that is necessary in the way of a workshop to initiate the beginner. As the work proceeds, the results will become more perfect and therefore more interesting, so that the reader will not hesitate to invest in such few tools as the constantly increasing scope of the work may make necessary. Remember, however, that the fascination of any of the crafts lies largely in the doing of original work, so that it is better to have made some simple thing of an original design than to make a mere copy of something more elaborate. If one is on the lookout, a suggestion for a design is apt to turn up almost any place, and among the advertisements of the current magazines or in labels and fancy wrappers, one may find an idea that will serve as the starting point for several original designs.

This series has nothing in common with that department-store, brass-covered woodenware upon which the design or pattern is already clearly stamped, thus leaving nothing more to be done except the punching of this pattern full of holes. That fixed operation permits of no originality, requires no talent, very little time and a like amount of intelligence.

Book Ends

Let us suppose that the following supplies have been purchased: About a half-pound bottle of nitric acid; a like amount of turpentine or kerosene; a few cents' worth of black asphaltum paint or varnish; a small and a large water-color brush; ten cents' worth

of lacquer; a sheet of carbon paper, and a piece of 16 or 18-gauge brass, measuring 6 by 7 $\frac{1}{4}$ in. A flat file and a pair of tin snips will be required sooner or later and may as well be purchased at once.

Square up the sheet of brass to the proper dimensions, and then



Effective Book-End Design

round off the corners rather liberally. About three of the seven inches must now be bent to a right angle to form the base portion. This operation should be done over the sharp edge of a table or between two pieces of wood held in the vise, so that the bend may be uniform along its entire length. Upon a sheet of paper make a full-size and accurate drawing of the design to be etched, and, after thoroughly cleaning the surface of the brass, transfer the design thereto by means of the carbon transfer paper, taking due care to keep the surface clean and free from grease.

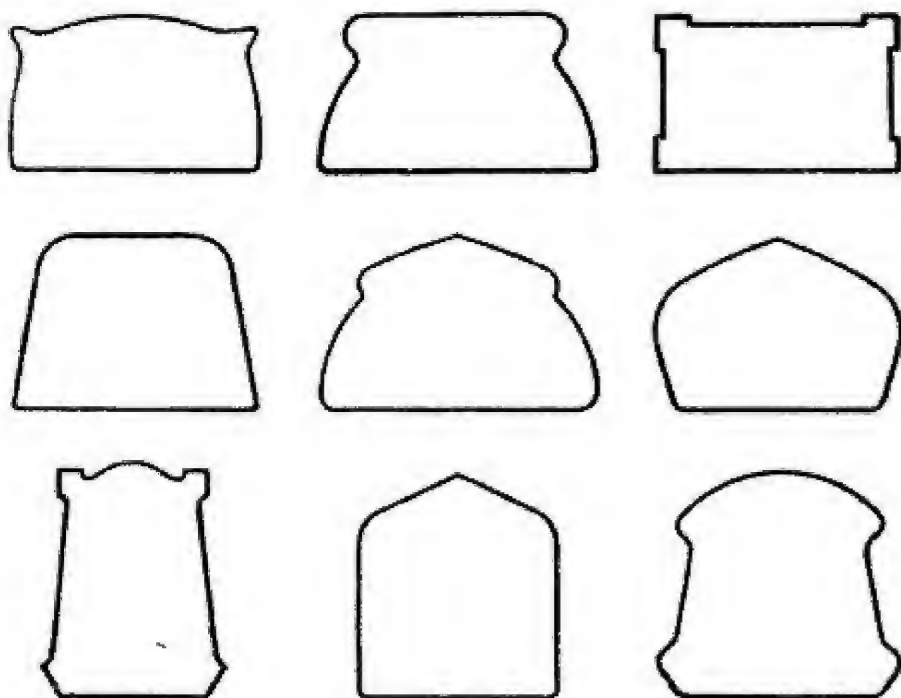
Now take the small brush and see that the asphaltum paint is of such a consistency as may be readily and accurately applied. If too thick, thin with turpentine, and then paint out all that portion of the design that is not to be etched. The larger brush will now be useful in expediting the application of the paint to the remaining portion of the face and to the entire back. That is, nothing but the darker portions shown in the illustrations should be left uncovered.

After the paint has thoroughly dried,

which may take from eight to twelve hours, the piece should be immersed in a solution composed of one part nitric acid to two parts water. In making this solution, be sure to pour in the acid last, or painful burns and damage to clothing may result. In the present instance, a glass tray, such as photographers use, will be found convenient. If after five or ten minutes the solution should bubble rather actively and throw off heavy greenish-yellow fumes, a little water should be added. The duration of the etching process will vary from one to four hours, depending on the strength of the solution and the composition of the metal. Until a little experience has been gained, it will be well to lift the brass from the solution every now and then to see how the etching is progressing.

As soon as the required depth has been obtained, remove the piece, rinse it off, and then remove the asphaltum by means of a rag after a good soaking

in kerosene. Finally, wash with soap and water, and dry. In order that the design may show up, the contrast be-



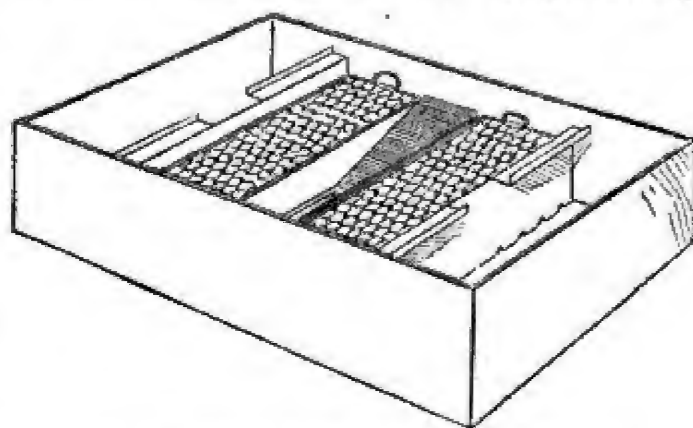
Outline Suggestions for Book Ends

tween the etched and unetched portions must be developed by means of some oxidizing agent such as a strong solution of butter of antimony, which soon darkens the clean surface of the metal. The high lights are then rubbed up with pumice or a piece of old emery cloth, after which a uniform coat of lacquer should be put on.

CELLULAR FEEDER FOR BEES

An ingeniously constructed cellular feeder for use during the early spring and fall, when nature does not provide sufficient nourishment for bees, has been designed by a French inventor. The feeder consists of a metallic box divided into five compartments. The middle one is the entrance, the end compartments contain the food supply, and the remaining two compartments are each provided with 250 feeding cells, which are perfect counterfeits of the cells of a bee comb. The food, which consists of syrup made of sugar, is poured into the end compartments and flows into the feed cells through notches in the bottoms of the

partition walls. The syrup only moistens the lower part of the cells, and the bees, each one selecting a cell, feed upon it undisturbed by neighboring

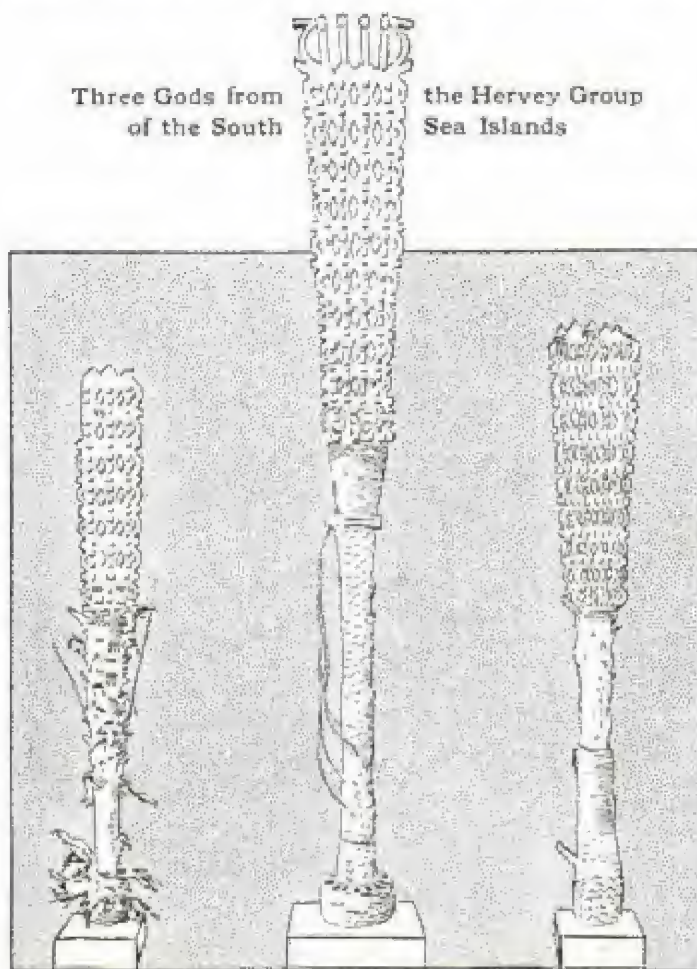


An Individual Feeding Cell for Each Bee

bees. Two inclined runways lead from the entrance compartment to the cell compartments.

POLYNESIAN IDOLS

Although the greater number of the Polynesian idols are in the image of man, some of those found in the Her-



vey group of the South Sea Islands are simply shafts, 4 or 5 ft. high, elaborately carved, with the stems bound round with cord. These are described as "district gods."

GREAT FIELD FOR SLAG IN CONCRETE MAKING

In the modern striving toward the conservation of our natural resources, the steel industry has played a not unimportant part. For many years the slag produced from the blast furnaces, amounting in this country to over 10,000,000 tons a year, has been practically a waste by-product, although within recent times it has been and is being used with some success to make paving bricks, as a base in the manufacture of Portland cement, for railroad ballast, and macadam in road building, etc. But these industries

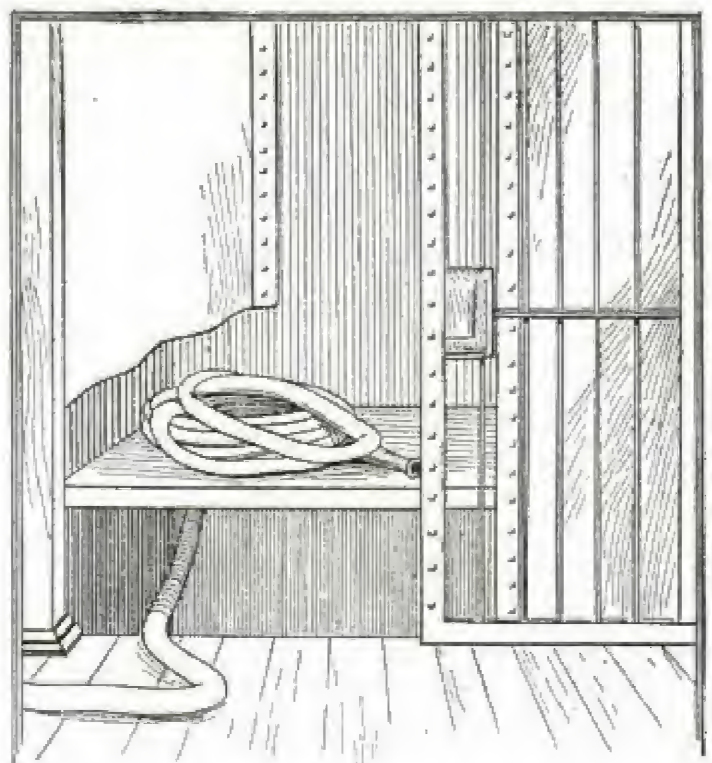
account for only a small percentage of the total yearly product.

Recently a big steel company of Pennsylvania made a series of tests on the use of slag in concrete making, and as a result it has announced that a mixture of 1 part cement, 3 parts sand, and 6 parts slag forms a fine quality of concrete, if the slag is treated in a special way and the mixture is properly made. These tests would seem to indicate a great field for blast-furnace slag in the concrete industry.

LIFTING FIRE HOSE BY BUILDING ELEVATORS

The latest idea for raising water for fire-extinguishing purposes to the uppermost floors of tall buildings is to lift the hose by means of the passenger or freight elevators. A simple attachment is provided for affixing the hose to the floor of the elevator, the pipe being coiled up in the bottom of the shaft so as to be easily raised.

In a recent demonstration at Memphis, Tenn., it was said that the water arrived at the sixth floor of a building practically as soon as the floor was reached by the elevator, and the fire

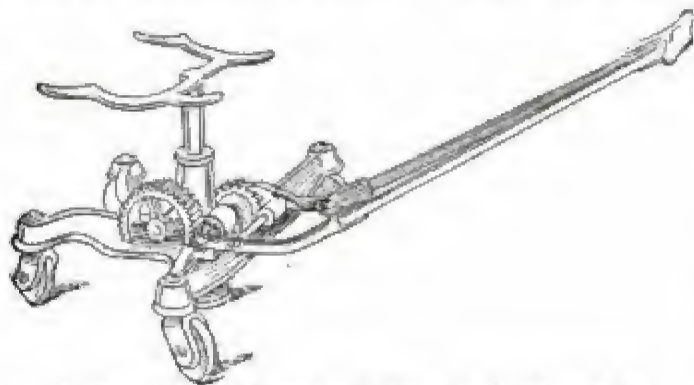


The Elevator Hose Conveyor

chief of that city recommended the compulsory adoption of the device by all buildings provided with elevators. The hose is inserted in the attachment about two sections behind the discharge nozzle, these sections being coiled on the elevator floor.

GEARED RATCHET LIFTING JACK FOR AUTOS

This geared ratchet automobile jack embodies several interesting features, among which are the lifting arms or antlers. The working mechanism is simple and easy to operate. A pinion meshes with the large gear wheel, the motion being imparted from the gear-wheel shaft to a pinion engaging a rack on the tube which slides up and down in the frame. The tube is



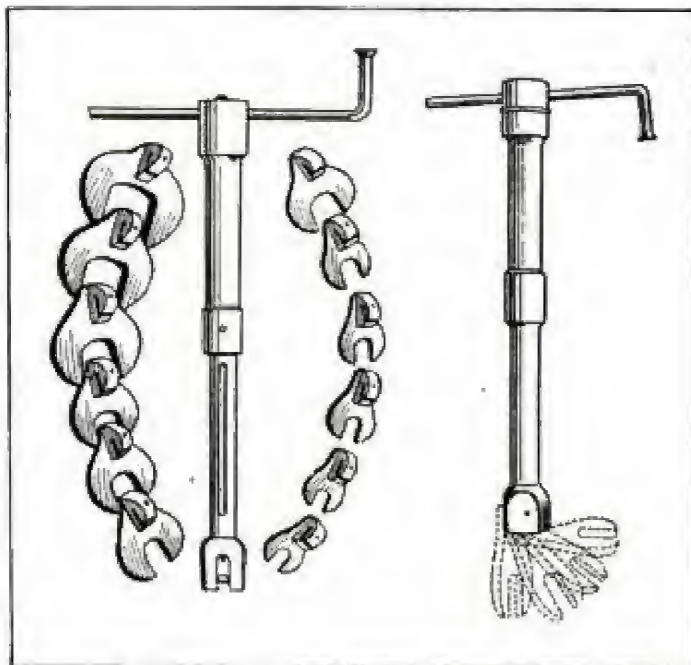
A New Geared Ratchet Lifting Jack Especially Designed for Automobile Garages

threaded on the inside, and into it screws the arms, which are called antlers because of their peculiar shape. The antler form was adopted as one which would fit the rear axle of any make of automobile. The short horns are for lifting front axles, but the others may also be used for this purpose.

The jack is mounted on four rubber-tired casters, with both ball and roller bearings.

ADJUSTABLE WRENCH SET

A wrench, whose heads or sockets can be adjusted to any position, enabling the user to get at nuts and bolts in difficult positions or in close corners, is here shown. The set consists of a telescopic extension reversible ratchet handle and 12 wrench heads. The dif-



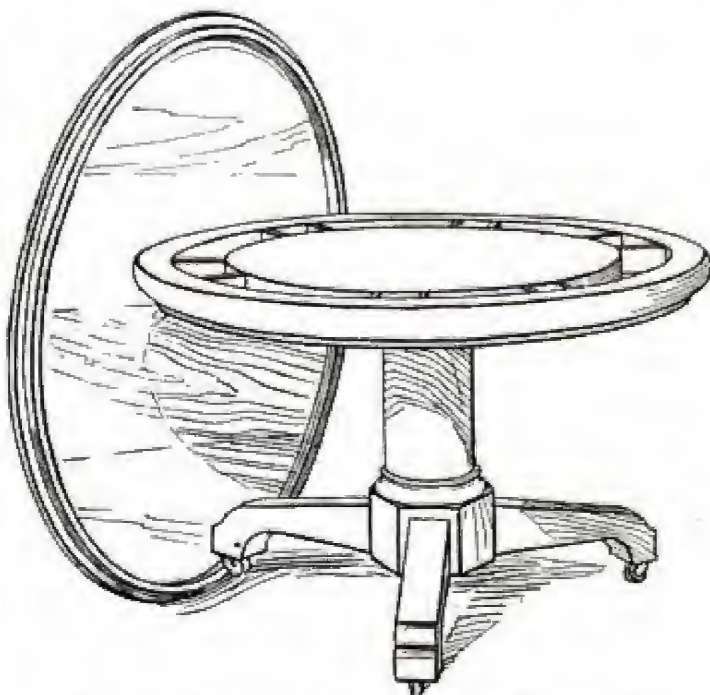
The Handle and 12 Wrench Heads

Showing Different Positions of Heads

ferent positions in which any one of the wrench heads in the set may be fixed for use is shown in one of the drawings.

CLEVERLY CONSTRUCTED CARD TABLE

A cleverly constructed card table, provided with sliding boxes in a circular running groove for each player's chips, cigars, ashes, etc., is here shown. It is adjustable to any number of players up to seven or eight, depending upon the size of the table, and can be reduced to accommodate a smaller



Card Table Provided with Sliding Boxes, in a Circular Running Groove

number of players by removing the sliding boxes. The table is provided with a removable top, so that it may be used as a center table, as for a library or dining room.

BELLOWS VACUUM CLEANER

In this hand-operated vacuum cleaner, which has been recently placed on the market, a bellows, strapped to



A Vacuum Cleaner Operated by Means of a Bellows Attached to the Back

the back and around the waist, provides the suction. A lever, worked to and fro by the left hand, operates the bellows, and the right hand directs the suction nozzle. The dust is drawn into the bellows, where it is confined by means of porous felt. The apparatus weighs only $5\frac{1}{2}$ lb.

CA German fish dealer has had a special car built for transporting live fish through long distances, the fish being kept in water which is constantly aerated by a motor-driven pump.

HAILSTORM PROTECTION IN FRANCE

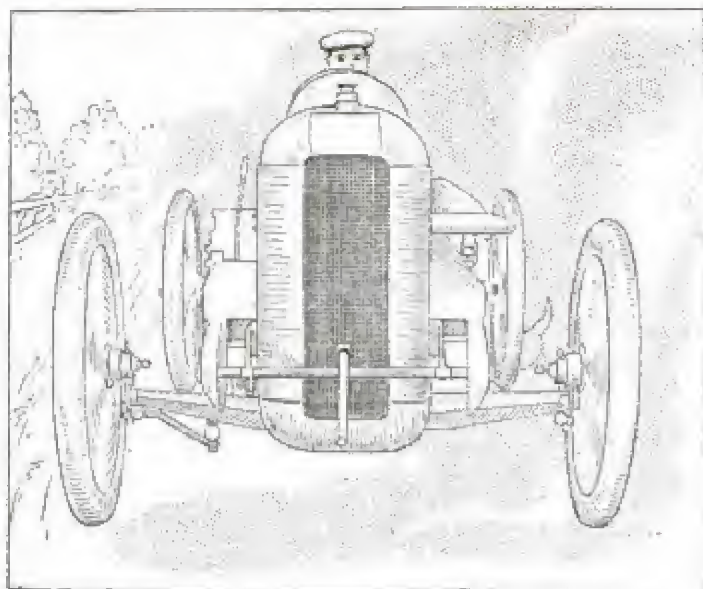
Working on the theory that hailstorms are closely associated with the electrical conditions of the upper atmosphere, a French inventor has constructed a line of lightning conductors of special design and $6\frac{1}{4}$ miles long, which it is proposed to extend right across France from east to west, with a view not only to protect against lightning discharges but to prevent the occurrence of hailstorms which often do great damage to the crops.

The lightning conductors, which their originator calls "electric Niagaras," comprise large sheets of electrically deposited copper provided on top with a special system of points and connected electrically with a water-bearing stratum in the earth below. Large surfaces, rather than great weights, are essential to carry off lightning discharges, which, on account of their oscillatory nature, are disposed to travel on the outside of electrical conductors instead of throughout their whole substance, as is the case with direct-current electrical discharges.

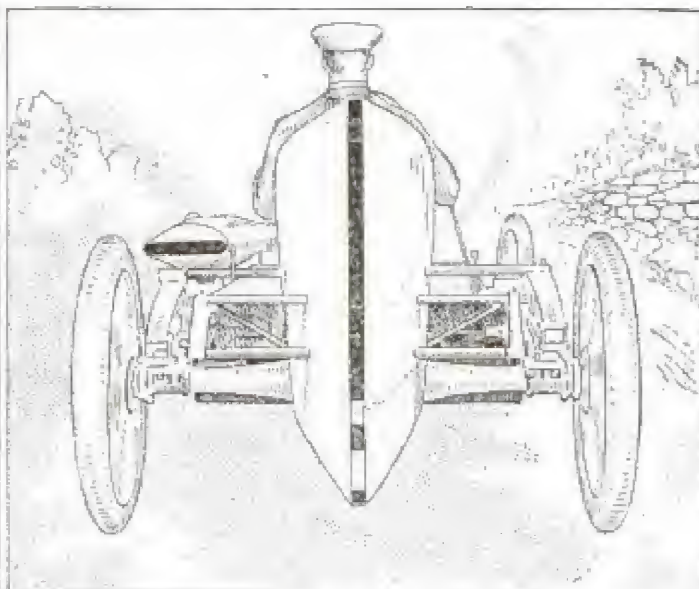
A PRINCE EDWARD ISLAND TUNNEL

One of the quaintest islands of the North American continent which, on account of its being cut off from the mainland by ice from about December to April, is living according to the ideas of at least half a century ago, will shortly have the chance to catch up with modern American progress, if present plans are approved. This new-world island with old-world customs is Prince Edward Island, in the Gulf of St. Lawrence. It is proposed to connect the island with the mainland of Canada by building a tunnel between Cape Traverse and Cape Tormentine, at an estimated cost of \$15,000,000.

There are practically no manufactures on the island, which depends for its livelihood on its agriculture and fishing and a few occasional tourists. Labor is cheap and abundant.



Showing Radiator and Front Carriage of Racing Automobile



A Curious Rear View Showing Ventilation Slot in Body

AUTO DESIGNED TO MINIMIZE AIR RESISTANCE

Front and rear views of a new English racing automobile are shown in the accompanying illustrations. The car presents a curious effect when viewed either from the front or the rear. The slot down the center of the rear end is for ventilation purposes.

BODILY RECUPERATION AND PHYSICAL LAW

That the human body recuperates from fatigue according to the same law by which a heated substance becomes cooled, is the latest discovery of a French scientist, and this seems to be borne out by experience. Thus a short period of rest suffices to prepare a person for new exertion after heavy but not protracted work, while a longer rest is necessary after continuous work of a lighter nature.

This new theory should be of interest to those who are developing the modern science of "scientific management" which aims to produce the maximum amount of work per day from a worker by carefully regulating the amount and duration of his periods of labor and intervening rests.

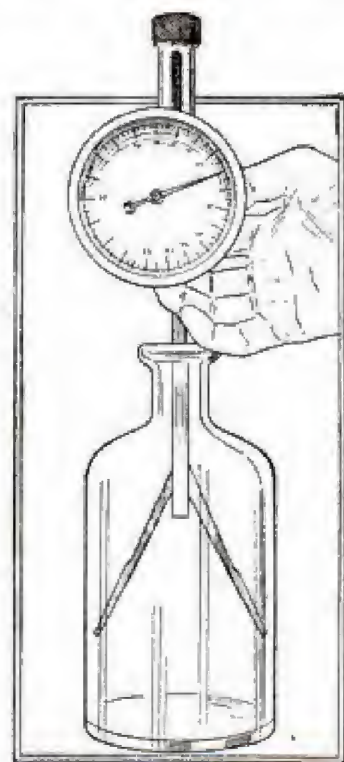
¶ There are 100 firms and individuals engaged in the manufacture of aeroplanes and aeroplane motors in the German empire.

SIMPLE CYLINDER-BORE MEASURING DEVICE

A simple but remarkably effective device for measuring the bore of an engine cylinder without disassembling any

of the principal parts has recently been invented. The instrument comprises two legs or feelers which are introduced through the compression or relief-cock hole and expanded until their ends touch the cylinder walls, the dimension being registered on the dial. These legs

or feelers are moved by a tiny cam which is actuated by pressing down a slide with the thumb. The instrument is carried in a small morocco case.

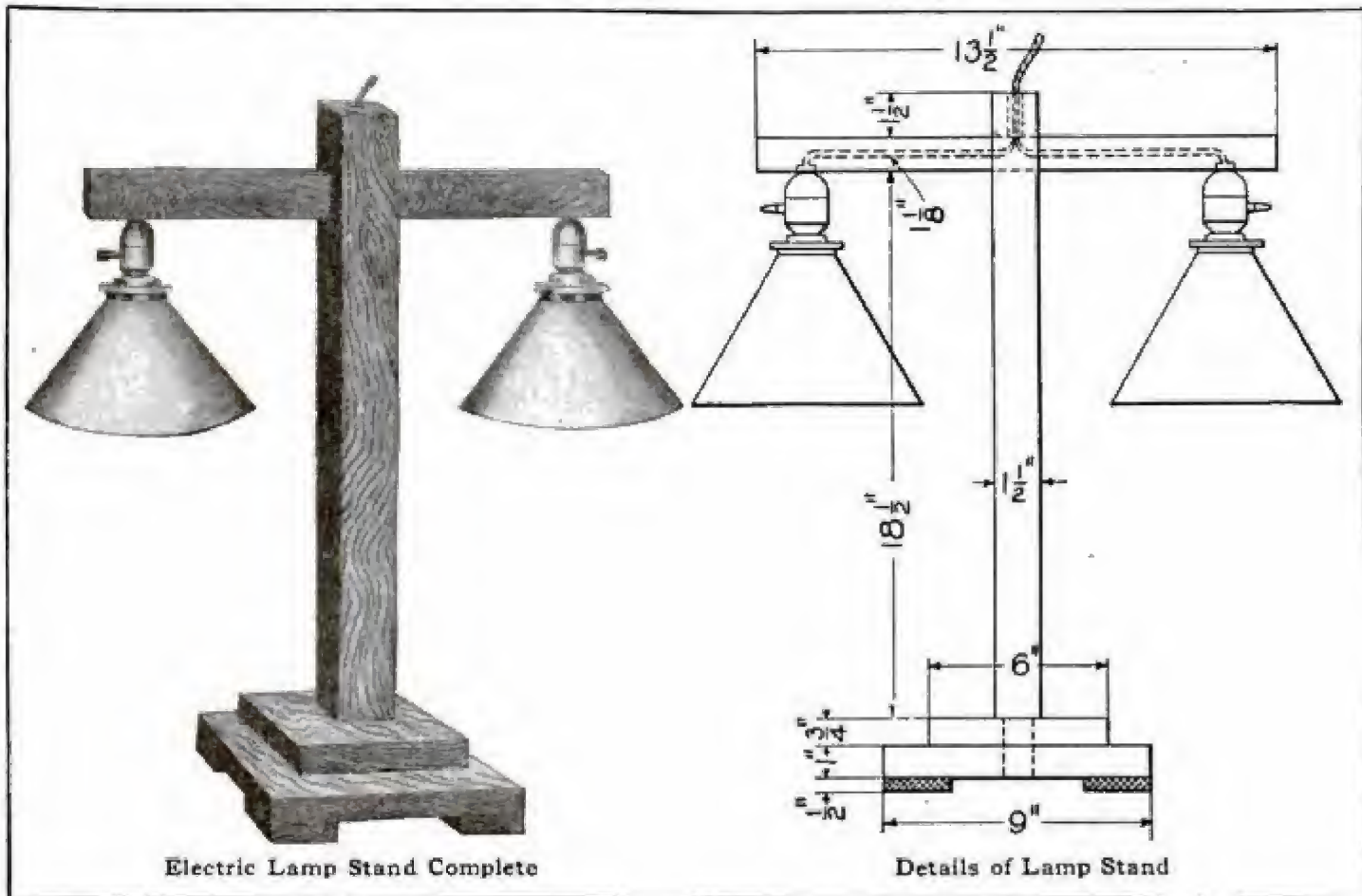


¶ Japan has recently been given a child-labor law that prohibits the employment of any person under 12 years of age, or the employment of any women or children under 15 years of age for more than 12 hours daily.

HOW TO MAKE A LAMP STAND

A mission table lamp stand for those who use electric lights is shown in the accompanying illustration. It is suitable for either the office or the home and is very simple in design and construction. The stock should be quarter-sawn oak and it can be ordered from the mill ready cut to length, squared

the detail sketch. A mortise, 1 in. square, is cut in the center of the blocks for the center post. Lead weights, covered with felt, should be attached to the bottom, as shown. The post has a tenon cut on one end to fit the base, and a mortise cut in the other for the arm. Holes are bored in the arm from



and sanded. The following pieces will be needed:

- 1 post, $1\frac{1}{2}$ in. sq. by 23 in.
- 1 arm, $1\frac{1}{4}$ by $\frac{1}{4}$ by $13\frac{1}{2}$ in.
- 1 block, $\frac{3}{4}$ in. thick by 6 in. square.
- 1 block, 1 in. thick by 9 in. square.

Square up the base blocks and fasten them together with screws as shown in

the ends for the wires. They can be plugged after the wires are in place. A hole is also bored in the top of the center post to connect with the holes in the arm for the lead wire. It is best to glue the joints together. Sandpaper the parts thoroughly, and stain.

ENGLAND'S ONE MONOPOLY IS CHINA CLAY

The only industry which the British are believed to have exclusively in their own hands is the production of China clay, used for the manufacture of highly finished paper, in the ceramic arts and the textile trade. The greater part, if not all of the product now comes from Devonshire and Cornwall, the latter producing by far the greater portion. The production is estimated

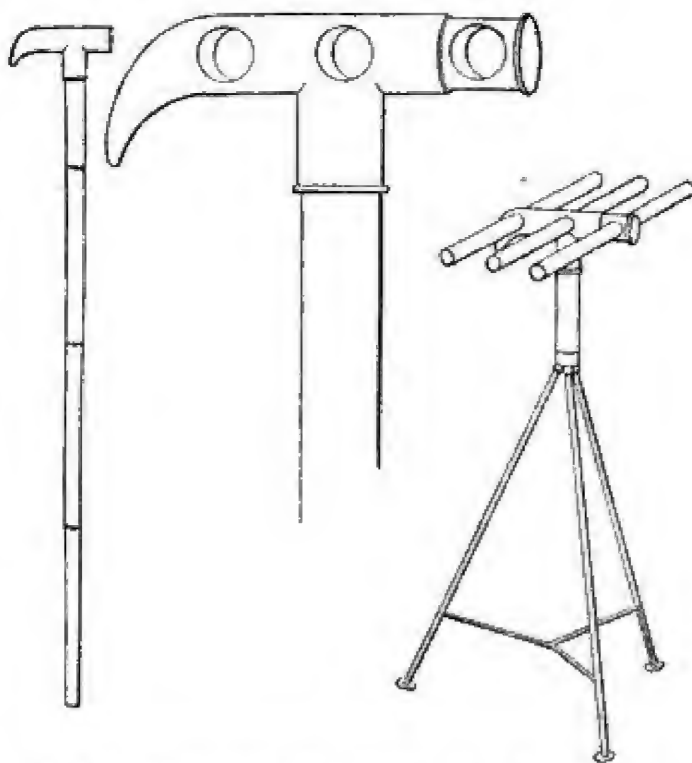
at 2,076,682 tons, annually, for the two sections, the value being set at 761,521 pounds sterling, or \$3,700,992. China clay is believed to be decomposed granite although scientists differ as to its exact origin. It is obtained in a simple manner which requires no great technical skill. It is usually found in beds shaped like a bowl or basin, between granite hills and is covered by

what is termed an "overburden" which varies in thickness from 6 ft. to 40 ft. A pit is formed by removing the overburden and a shaft is sunk outside the bed on more solid ground conveniently near. A passage called an "adit level," being almost horizontal but sloped enough for drainage, is driven from the shaft into the bed of clay. A stream of water is turned into the top of the pit and runs down over the face of the clay. Workmen stamp about in the pit to dislodge the clay, which then flows in liquid form into a hole in the bottom of the pit through the adit level to the bottom of the shaft, from whence it is pumped to the surface. Sand, mica and other impurities in the clay are separated in what is known as a "mica drag," a tank or basin so arranged that the mica and other particles fall from the clay proper by force of gravity. The clay is then passed into settling tanks and from these the water is drawn off and the deposit of clay removed to the kiln where it is dried in blocks. In this form it is shipped to the potteries or other factories using it. There are several grades of the clay and the supply of none of them is quite equal to the demand. In the United States a clay that has some of the characteristics of the China clay is found in the South and is called "edible" clay from the fact that many people eat it and the further fact that pottery clays are often tested by being chewed, that which remains in a gummy state after chewing being regarded as of good grade.

COMBINED CANE AND CAMP STOOL

This new French novelty cane is made of light but very strong steel tubing and can be taken apart and set up as a stool in about 30 seconds without the use of any part not contained in the cane. The unscrewing and drawing out of one end of the handle brings to light three holes, into which are inserted the three lower sections of the cane tubing, thus forming the seat. In-

side the cane tubing are the three legs forming the tripod. These are joined to a head which screws into the top section of the cane tubing.



A Cane That can be Changed into a Stool in 30 Seconds

The seat thus formed is the average height of the ordinary stool and will support a weight of two or three hundred pounds. The device is designed especially for sportsmen, tourists and painters.

NEW TURBO-LOCOMOTIVE WITH NOVEL FEATURES

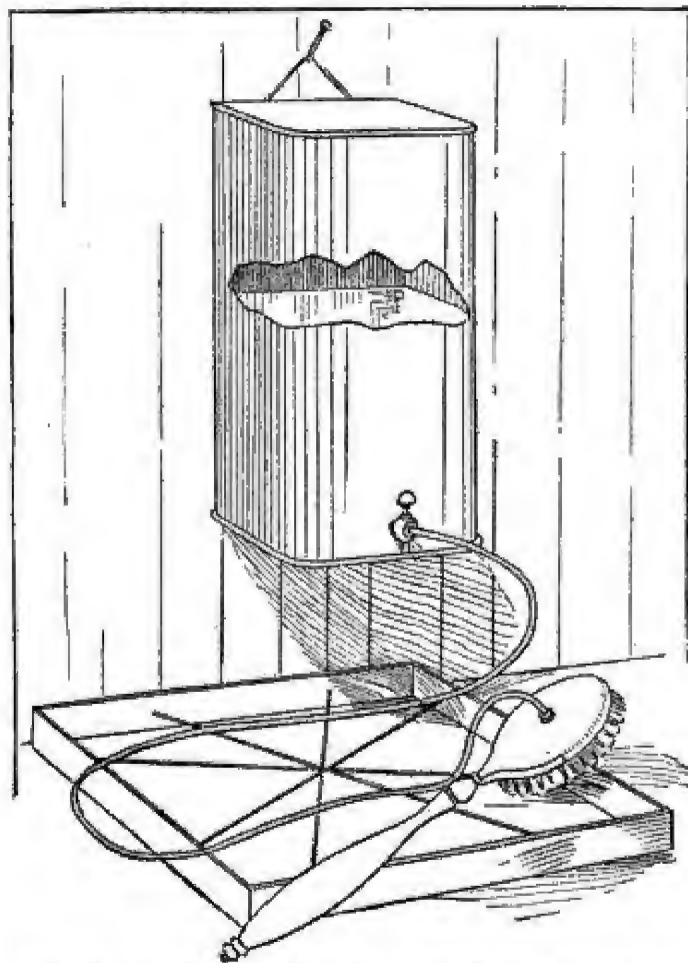
A small turbo-locomotive with a turbine designed on entirely new principles is reported to have given favorable results in its recent try-out at Milan, Italy.

The turbine has four sets of movable blades, operated in series, and at high speed the steam strikes the first set of blades only, while at intermediate speeds two or three sets are utilized. The reversing mechanism is unique. On the rotating elements there are two sets of blades curved in opposite directions. When running in one direction, the steam passes over the blades at the outer circumference from left to right; when running in the reverse direction, the steam passes over the other set of blades from right

to left. The energy loss due to the blowing action of the additional set of blades is very small, amounting to from 2 to 3 per cent of the total. The steam consumption on test did not exceed 38 lb. per horsepower per hour.

PORTABLE SHOWER AND FRICTION BATH

This novel portable bath outfit is being introduced in Australia. It comprises a metallic container, a rubber



Shower or Friction Bath with Portable Bath Outfit

hose, a shower brush, and a light tray to receive the spent water. The container, filled with a gallon or two of water, hot or cold, is hung on a hook or placed on a raised shelf. The bath combines cleansing, friction, massage and shower, through the proper manipulation of the brush.

NEW USES FOR ROAD DRAGS

The road drag was an invention of a resident of Missouri. It has remained for other Missourians to find new uses for it, says Engineering and Contracting. For example, a farmer living near

Columbia, Mo., has used his road drag for carrying produce to town, thus improving the road and at the same time saving the wear on his wagon. Another farmer has gone a step further and combined business with pleasure. His wife wished to visit a neighbor living about a mile away. As he was using his team to haul a road drag, he made a seat on the drag and hauled his wife to the neighbor's and later brought her home in the same way. A still further use for the road drag has been suggested. This is the requiring of all joy-riding motor cars to tow road drags, thus improving the roads and at the same time reducing the speed of the cars. It might also be suggested that road overseers who neglect the roads in their charge, should be required to ride on the road drags attached to the joy-riding cars. This would add the ballast necessary to make the road drag hit the ground occasionally.

TESTING MATERIALS WITH A SAND BLAST

The sand blast—a spray of sand blown by compressed air—has long been used for cutting and abrading materials, but it has remained for a German scientist to apply it for testing building materials. A blast of fine quartz sand under an air pressure of two atmospheres was used to test the resisting qualities of granite, pine, linoleum, and other substances, in some recent experiments at the Gross-Lichterfelde Institute, Germany, and furnished a good means of comparing the wearing qualities of these materials in external and internal building construction. The time of each test was two minutes.

CA French aeroplane manufacturer recently offered five of his monoplanes for sale on the installment or "easy-payment" plan to licensed aviators, the only condition being that the machines and the purchasing airmen take part in the aviation meets of the year in France.

The Kingdom of Dust

By J. Gordon Ogden, Ph. D.

THIS is the eighth of a series of articles by Dr. Ogden, who is professor of physics at the Fifth Avenue High School, Pittsburg, Pa. In every home, in every office, in every shop or factory, the fight against Dust is never-ending. Dr. Ogden illuminates this subject in a manner which brings a realization of its infinite importance.

VIII—The Right Hand of Death

MOST of us are familiar with the beautiful and artistic conception of French, wherein a young sculptor who is plying his magic chisel upon a block of stone, and summoning from the snowy depths of the marble the dream face of his soul's ideal, is gently touched by the wistful-eyed Angel of Death, and the skillful arm forever stayed. The whole creation is marvelously beautiful and the world is better for its birth. Nevertheless it is allegorical and misleading.

The real Angel of Death in the case of the thin-faced sculptor was not a sad-visaged maiden of classical profile. In all probability it was a minute, rod-like organism floating amid motes of dust and known to scientists as the "bacillus tuberculosis." The writer does not want to be a shatterer of ideals, but the sooner such poetic notions of death are done away with, and the mass of the people educated in a commonsense way to the dangers of dust and bacteria, the better it will be for humanity in general.

Death is likewise represented as a

scythe. A truer representation of the king of terrors would be a round-cheeked housemaid wielding a broom and dust-cloth, or a cloud of dust stirred up by the passage of an automobile along a crowded dirty street.

Bacteria are tiny little plants, so small that 50,000 of some varieties may be placed in single file along a line one inch in length. They are barely visible under the highest power of the microscope, and there is no doubt that there are untold myriads of bacteria that are absolutely beyond the limits of definition of any microscope as yet known to science.

Although these bacteria are so minute, they make up in numbers what they lack in size, and if the animal life of the globe from the elephant down to the flea were to be aggregated into one mass, this mass would probably be far less than the aggregate of all the microscopic forms of life, animal and vegetable.

Bacteria are divided into three great classes—the spherical, known as cocci; the rod-shaped, known as bacilli and bacteria, and the spiral. It was orig-



"THE ANGEL OF DEATH"
Conception of Death of Young Artist by French, the
Famous Sculptor

inally thought that bacteria were animals, as some of them, such as the bacilli, have the power of moving from place to place. It is a well known fact, however, that many plants possess the power of locomotion, and it is now admitted that bacteria are plants.

This power of locomotion, possessed by many bacteria, is due to locomotor organs known as "flagellæ." The flagellæ are tiny hairs that whip and lash the fluid in which the bacteria flourish, and thus cause motion. The simplest of all the bacteria types is the coccus. The cocci consist of tiny spheres, without the slightest evidence of any internal structure. Sometimes they form long threads or chains, while others of the same general species form irregular masses, resembling cannon balls piled into the form of a cube. The rod-shaped bacteria are, as the name would indicate, tiny rods that lengthen and break up into smaller rods, which in turn repeat the process indefinitely, as in this manner they are reproduced.

A bacillus is one of the rod-shaped bacteria that have flagellæ, and is, consequently, capable of motion; while a bacterium proper is rod-shaped, but has no flagellæ. The spiral bacteria are less often met with, and like all other kinds of bacteria, may or may not have flagellæ.

In a preceding article it was pointed out that yeasts and bacteria are fungi. A yeast, however, is known as a budding fungus, as the new individuals

appear as buds on the older cells. Bacteria, on the other hand, reproduce almost entirely by "fission," or the splitting of the parent cells. We say "almost entirely,"

because it sometimes happens that bacteria reproduce by means of spores that germinate into individual bacteria. So far as human life and disease are concerned, the formation of these spores is especially important in that they are much harder to kill than the bac-

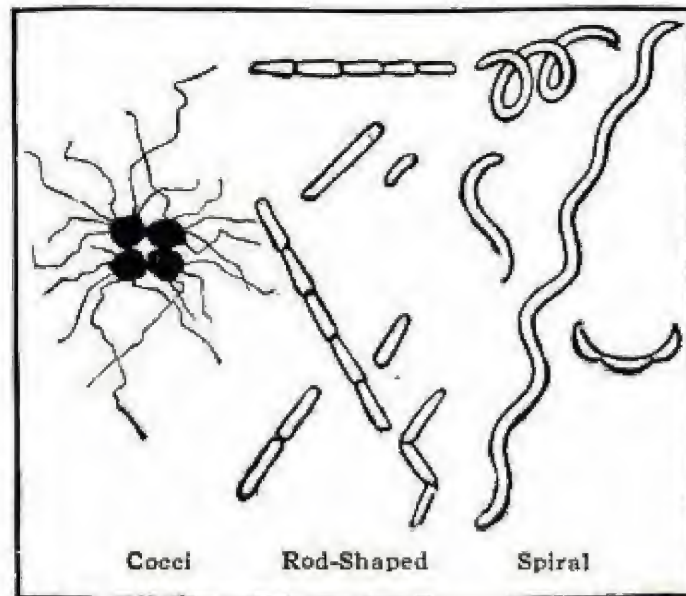
teria themselves. For example, they can be dried perfectly, whirled along in a cloud of dust, and be ready for active work as soon as they reach the proper medium. They will withstand greater extremes of temperature, likewise, and are therefore exceedingly persistent.

Some bacteria have the power of reproducing themselves every half hour. Let the reader sit down quietly with

pencil and paper and figure out what the progeny of such a micro-organism would be at the end of 24 hours. In other words, multiply the number two by itself 47 times. One can hardly realize the

frightful rapidity with which bacteria multiply unless some such calculation is made. Of course, they do not all live. Hence we live, and have some chance to remain alive.

As has been stated, the number of bacteria is legion. Fortunately for us, the greater part are harmless, and some are beneficial to man; but there are enough of the deadly kinds to more



Three Types of Bacteria Which Cause Disease



Fig. 1—Petri Plate Exposed in Lecture Hall of Fifth Avenue High School, 8 a. m., before the Arrival of Pupils



Fig. 2—Similar Plate Exposed in Same Place at Noon Recess, Showing Mold and Colonies of Bacteria Collected

than offset the good done by the benignant types.

As regards the distribution of bacteria, they are practically everywhere on the globe. In crowded cities, in purling brooks, on lofty mountain tops, in shaded vales, in Arctic wastes, and in tropical forests; frozen by winter's icy blasts, or baked by the withering simoon of the desert, they live and move and have their being. They are found in the ice in our refrigerators, the bread in the oven, the cream in the pitcher, the vegetables in the garden, and the meat on the butcher's stall. The human mouth contains as many as 27 different varieties of these children of the dust.

Even under the most unfavorable conditions, they thrive to a certain extent. For example, in the Boston City Hospital, where the most rigid sanitary conditions prevail, the number of living bacteria to every cubic foot of air was found to be 1,350, and of

molds, 675. In Central Park, New York, 1,500 bacteria were found in every cubic foot of the presumably pure air of that favored resort.

The number of bacteria in a given quantity of air or other container, is ascertained by what is known as the "culture" method. A thin bouillon or soup is made from gelatine, peptone, and Liebig's extract of beef, or from agar-agar (a preparation derived from Iceland moss).

This medium is first rendered sterile by dry steam. It is then placed in a small glass dish known as a Petri plate, about $3\frac{3}{4}$ in. in diameter, and allowed to harden, after having been securely covered with a glass plate. These plates are then exposed for a few minutes to the air, and the dust particles settle on them. They are then closed and kept at a temperature of about 70 deg. Fahr. for two or three days, when a number of colonies appear, made up of molds of bacteria. Figures 1 and 2



Possibly Our City Fathers may Learn, Some Day, that the Hose and not the Sweeper should be Used on the Public Highways

show the result of such exposures in the lecture room of the Fifth Avenue High School, Pittsburg. Those in Fig. 1 were exposed for a few minutes at 8 a. m. while the room was practically free from bacteria, as the pupils had not arrived, and there was comparatively little dust. Figure 2 shows the result of a two-minute exposure at noon, immediately after the passage of a large class through the room. The larger form in the center of the plate is a mold while the small dots around it are colonies of bacteria.

A five-minute exposure of Petri plates on a public street where the sweepers have just passed in their unsanitary, death-dealing march, revealed the presence of 5,810 living germs in the small space of less than four inches. Possibly our city fathers may learn, some day, that the hose and not the sweeper should be used in the public highways.

Bacteria cause three classes of diseases. In the first class, of which pneumonia is the type, the bacteria enter the general blood circulation of the body and reproduce enormous numbers of the tiny plants that feed on the tissues of the organs infected, or else produce loss of function of the organ by clogging the cells. Bacteria of this class produce what are commonly known as septic diseases.

In the second class, of which diphtheria and lockjaw are the types, the bacteria, like those of the first class, settle in some part of the body, but in addition, they produce poisons known as toxins, that are carried throughout the body. These toxins are concentrated poisons that cause cell death. The blood carries the toxin to all parts of the body, while the bacteria that produce the toxins do not leave the part of the body originally infested. It is generally conceded that a cell, once infected, must die, and the only possible hope in cases of diseases of this class, is the formation of an antidote, or "antitoxin," as it is termed. This the body can do, and very often does. Sometimes, however, it takes too long

for the body to do this, and the toxins, untrammelled, poison enough of the cells to produce death. The knowledge that toxins are formed in the body has proved to be of enormous value, as antitoxins, which neutralize the poisons, have been artificially prepared. The antitoxin of diphtheria, for example, has cut down the mortality from this erstwhile plague of childhood, from 90 per cent to practically zero, as it is an infallible cure when administered in time.

The third class of bacteria-caused diseases is represented by typhoid fever. In this class not only do the bacteria enter into the circulation, but their toxins likewise move freely throughout the system.

To which of these classes belongs the great white plague, the right hand of death, is not known. Curiously enough although so much study has been given to this dread disease, tenfold more than to any other ailment of the human race, we do not know whether Koch's famous bacillus kills by multiplying in the tissues, or by producing poisons that destroy the cells.

It would be useless for the writer to attempt to convince any of his readers of the frightful mortality due to "consumption," the older and better name for tuberculosis. Every one is already convinced. More than half of all the deaths in the world, from the equator to the poles, is due to this destroyer.

And the pity of it is that it is avoidable! If the excreta from consumptive and typhoid patients were to be destroyed, instead of being sent into the Kingdom of Dust, in a single year both diseases would disappear from this planet. Consumption is dust-borne. Typhoid fever is water-borne, or milk-borne. In accordance with the germ theory of diseases, so generally accepted, if we would destroy the germs, there would be an end of the disease.

Unfortunately, the chosen places of the earth, climatically speaking, such as Denver and Asheville, where the natural conditions are most favorable

for patients suffering from tuberculosis, have become hot-beds for the growth and dissemination of this disease. By every train, sufferers come to these places, and congregate in a comparatively narrow area. Every swirl of dust in these centers of infection carries more germs than are to be found anywhere else, and it is almost a miracle when any one recovers in these nurseries of germs, the conditions, other than climatic, being so adverse.

What shall we say of the careless men and women, who deliberately eject into the public streets, highways, and conveyances, sputum that may contain billions of germs, which, when they are dried, shall join the Kingdom of Dust, as the right hand of death? Were a man to run amuck through the crowded streets of our cities, stabbing and shooting, right and left, what would be done with him? In self-defense, one would shoot him down as though he were a beast of prey. And yet, he

would be comparatively harmless, as he could wound or kill only a few people before he were stopped. Yet we permit the well dressed gentleman or lady, educated and apparently refined, to expectorate upon the streets, although we know, absolutely know, that their sputa might and probably will, cause hundreds of thousands of deaths. Such unfortunates are infinitely more dangerous to the welfare of mankind than the poor madman who runs amuck, and is shot down as a beast.

If we are to fight the great white plague, it must be through the means given to us by science. We know the cause. We know how to stamp it out. Stringent laws concerning expectoration and the disposal of excreta should be passed by every law-making body in the world, and the people made to save themselves from the terrible, frightful punishment inflicted upon them by the bacillus tuberculosis, the grewsome right hand of death.

KEROSENE GAS-PRODUCER FOR GASOLINE ENGINE

Gasoline-engine experts and operators will be interested in a new device which, if the claims for it are substantiated in practice—and the manufacturers are said to guarantee them—will enable any two-cycle or four-cycle gasoline engine of standard make to be run with kerosene as a fuel, with perfect combustion, no increase in fuel consumption, and no decrease in power.

This device is known as a hydrocarbon-gas producer. It is quite a simple affair, cylindrical in shape, about 14 in. long and 6 in. in diameter. It has no moving parts, and, when once attached to the engine, becomes a permanent fixture and requires no attention whatever. When it is installed on an engine, the fuel is drawn in through an atomizer and induced by the suction of the engine to go through passages heated by the exhaust, so that the action is entirely

automatic and the fuel supply is in proportion to the demands of the engine under all conditions of speed and load.

The producer is said to be applicable both to stationary and automobile engines, to produce perfect combustion of the fuel, and thus absolutely insure a smokeless exhaust and clean cylinders.



A Simple Device That Enables Any Standard Make of Internal-Combustion Engine to Run on Kerosene as a Fuel

PERUVIAN SAIL BOAT MADE OF REEDS

Among the most curious of the South American native boats is the "balsa" of Peru. This boat is made entirely of



Peruvian Sailboat Made Entirely of Reeds and Straw reeds and straw, and has a curiously shaped bow and stern. The sail is of straw, and a long pole is used to steer and to help push the boat along.

THE MANUFACTURE OF ARTIFICIAL EYES

Unauthenticated accounts seem to show that man utilized artificial eyes in early times, but the first reliable report was given by the French surgeon Ambroise Paré in 1560. Two kinds of artificial eyes were known to him, the "ekblepharos" and the "hypoblepharos," the first consisting of painting the eye and all the surrounding parts as far as the brows on a plate, which was placed in front of the eye socket and held in

position by a string tied over the head. The second was used in a manner similar to that of today, being put behind the eyelid, in the eye socket itself, and was composed of a copper, silver or gold shell, covered with enamel and glass fusions.

It was not until the close of the 18th century that it was found possible to do away with the metal shell altogether and employ only enamel and glass, the material then coming into use being a soft lead glass, easily shaped, but also easily destructible. As late as 1880 all artificial eyes, no matter where made, showed a pronounced boundary line between the iris and the outer covering of the eye. These parts touched each other sharply, while in the human organ the outer covering turns into a transparent coat called the cornea and is lined with a highly pigmented membrane called the choroid, which changes according to the state of health of the eye. Attempts to imitate this peculiarity of nature were finally successful, so that now this choroid can be produced to suit every case.

With the above discovery, the last link in the chain for producing a successful imitation of the iris was found, but the shaping of the eye still required improvement. The latest result is called the "reform eye." It must be made to fit the eye socket exactly, and in most cases can be worn even at night.

The artificial-eye industry of Germany centers about Lauscha, which is near Coburg. It is a house industry, the eyes usually being made by one member of the family, who hands the art down to the next generation. A gas flame is used for melting the glass, and the manufacture is as follows: A small drop of white glass is put on the white blown ball from which the sclerotic or outer covering of the eye is to be made, and is then blown so as to make a circle about 0.315 in. in diameter. On this circle the structure of the iris is built by means of thin, variously colored glass rods. A drop of black glass makes the pupil, crystal glass is melted over the finished iris in order to

imitate the cornea, and by means of a thin, pointed red rod, the blood vessels to be seen on the hard coat of the human eye are melted in.

ARROW POINTS DIRECTION MOTOR CAR WILL TAKE

One of the simplest and most easily understood mechanisms for indicating to traffic in the rear the direction a motor car is about to take, is shown in the accompanying illustration. It is a large arrow, attached to the rear of the car just to one side of the license number, and actuated by a simple hand lever. When the car is running straight ahead, the arrow points vertically; but when a turn to right is con-



Simple and Practical Indicator of Direction an Automobile is About to Take Prevents Collisions from Behind

templated, a turn of the lever swings the arrow in that direction, a turn to the left being indicated by swinging the arrow in the opposite direction.

HIDEOUS MASKS PLACATE THIBETAN GODS

Among the most grotesque forms of religious ceremony students give a prominent place to the festivals of the Lamaist church of Thibet during the course of which hideous masks are worn by the participants and the most fantastic dances are staged. Lamaism is a corrupt form of Buddhism, states Dr. Sven Hedin, who made exten-



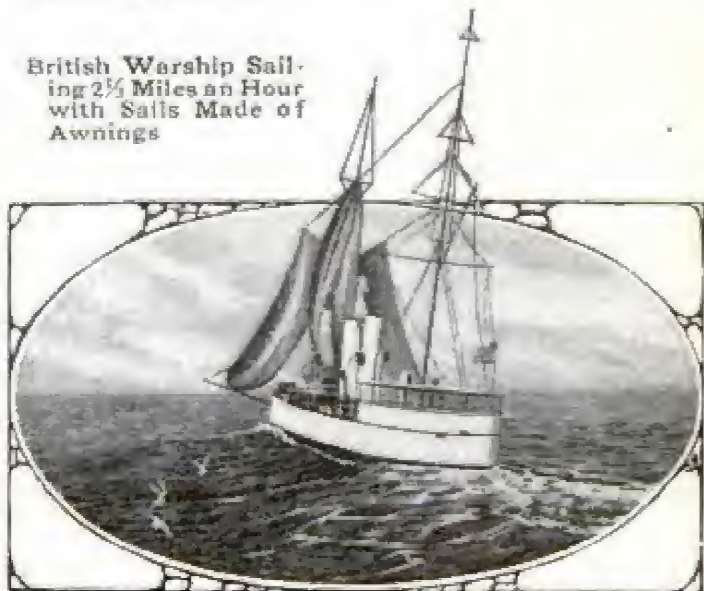
Some of the Grotesque Masks Used in Religious Ceremonies in Thibet

sive investigations and explorations in Thibet. The object of these ceremonies is usually to propitiate the powerful demons that reign everywhere and whose only function the religious fanatics believe is to plague, torture, and persecute the people of the earth.

BRITISH WARSHIP USES AWNINGS AS SAILS

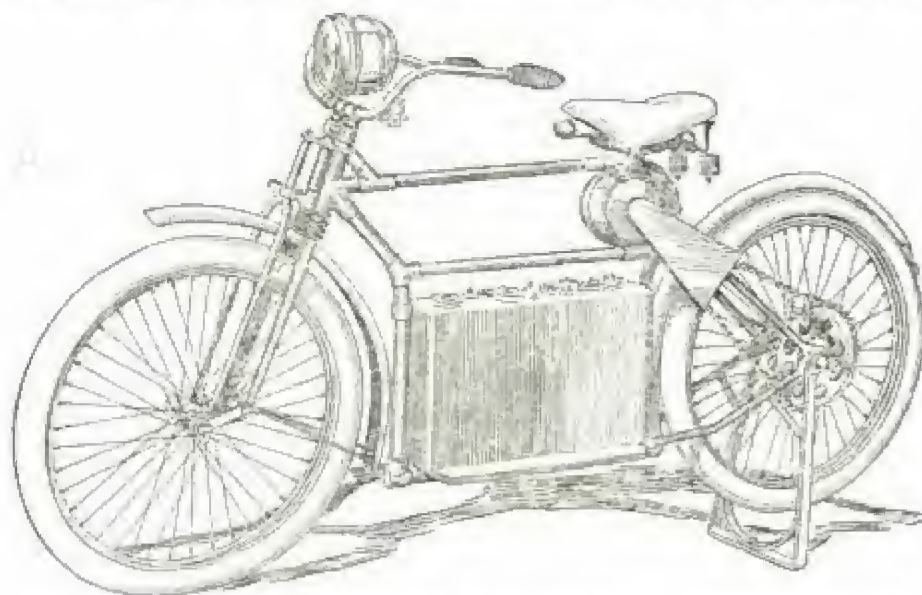
The British warship "Proserpine" of the East Indies squadron ran short of coal about 300 miles from Colombo, Ceylon, and was compelled to resort to sails. Not being equipped with this necessary adjunct of wind propulsion, sails were made of all the awnings, and other large pieces of canvas available. Her speed so rigged was $2\frac{1}{4}$ miles an hour.

British Warship Sailing $2\frac{1}{4}$ Miles an Hour with Sails Made of Awnings



ELECTRIC MOTORCYCLE

Motorcyclists who object to the trouble of starting the gasoline-driven cycle, or to its gatling-gun-like exhaust, will welcome a new type of electric motorcycle which is being introduced, and which, it is claimed, will



Simplicity, Ease of Starting and Noiselessness in Operation are the Features of This Electric Motorcycle

run from 75 to 100 miles on a single battery charge, start instantly on the turn of a switch, and run absolutely without noise.

The motor, which is located under the seat, drives the rear wheel by means of a chain and sprocket wheels, and is connected to the three-speed controller which provides for speeds of 4, 15 and 35 miles an hour. The 6-cell, 12-volt battery is suspended in the lower part of the frame, and any of the standard types may be used. The motorcycle has a 51-in. wheelbase, and weighs complete about 200 lb.

DISTILLATION OF ORANGE FLOWERS IN FRANCE

It will be news to most people that the distillation of orange flowers is one of the most important industries of the French Riviera. No less than 3000 tons of these flowers—enough to deck innumerable brides—are produced annually for the purpose of making essential oils used in the manufacture of perfumes, an industry in which the French are unexcelled. The leaves

and even the young fruit of the orange are used, as well as the flowers, for this purpose.

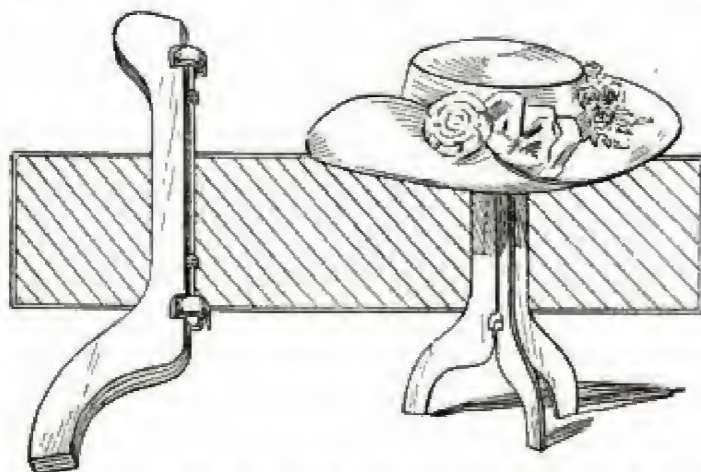
There are several varieties of orange tree used in this unique branch of trade, but the best quality of oil, called "néroli," is obtained from the flowers of a wild bitter-orange tree, locally termed "bigaradier." The flowers are gathered in the month of May.

The preferred form of still used in the distillation process is smaller at the bottom than the spirit still, and somewhat higher. The flowers rest on a grating so as not to be scorched by the direct heat of the fire. From a still containing about 90 lb. of flowers and about 12 gal. of water, from 6 to 8 gal. of distillate are obtained. The essential

oil is collected from the top of the distillate and is worth, in the best qualities, from \$45 to \$90 a pound. The remaining perfumed water—orange-flower water it is called—brings about 5 cents a quart on the market. About 500 lb. of orange flowers are required to produce 1 lb. of essential oil.

A PORTABLE HAT-STAND

To prevent madame's latest creation in the way of headgear from being damaged by lack of suitable supporting facilities while my lady is on her



The Folding Hat-Stand Ready for the Suitcase and in Position Supporting a Lady's Hat

travels, a Parisian firm has introduced a folding hat-stand which can be easily carried in a suitcase and quickly adjusted to accommodate the most fragile of feminine hats without fear of disfigurement.

The hat-stand is simplicity itself. It consists of three legs which fold together as shown in the sketch. When the legs are unfolded like those of a three-legged table, two catches drop and hold them in place, and the device is ready for use. An inversion of the stand releases the catches and permits the apparatus to be folded together again for packing in the suitcase or grip.

A COMPREHENSIVE FIRE-ALARM SYSTEM

What is probably the most perfect fire-alarm system in the world has recently been installed at Krefeld, Rhenish Prussia. Alarm boxes are distributed throughout the city, and when an alarm is turned in at any one of them, the receiving apparatus at the fire station automatically registers the number of the box and the time, alarm bells are sounded in various parts of the station, the number of the alarm box is displayed at each of various boxes conspicuously placed about the station, and the location of the alarm box is luminously indicated on a plan of the city.



Indicates that Fire-Alarm Box No. 378 Has Been Rung in the City

The illuminated number boxes, one of which is shown herewith, contain a number of small lamps which are combined into numerals by an electric selecting device. Another apparatus takes care of alarms that may be turned in simultaneously.

THE SALVATION NAVY

The branch of the New York Salvation Army which works the waterways of that city is now being spoken of as the Salvation Navy. The flagship is the launch "Jerry McAuley," presented to the Salvation Army by Bradford Lee Gilbert. Religious services are held on board twice a day, and the boat runs from point to point in search of converts.



The Flagship of New York's Salvation Navy



A TWENTIETH-CENTURY SCRIBE

By ROY O. RANDALL

FOUR hundred and sixty-one years ago a hooded monk sat at his accustomed desk close to the window of a monastery in the suburbs of Milan, Italy. He was finishing the text and illumination of a manuscript on vellum, a rare and beautiful work of art. Finally it lay before him complete and perfect, save for the signature and date. These he placed with marvelous skill and accuracy within a perfect circle of black and red: "Guinifortis de Vicomerchata, Milan, 1450." He then sprinkled sand from a bronze vessel with perforated top over the page still wet with ink. A few moments passed and he shook the sand from the page into a shallow tray. Then he picked up the completed book and turned its pages, one by one, with the pride of the artist who sees before him a masterpiece from his own hands.

Today that manuscript, with its wonderfully preserved colors, reposes in a mahogany case in a modern "scriptorium" located in the heart of Chicago where, with scores of other fine examples of ancient and medieval writ-

ing, it serves as an inspiration and guide to scribes of the twentieth century. For, notwithstanding the development of printing, the art of the scribe and illuminator still survives. Unlike the printer, however, the scribe does not advertise, as that would conflict with the ethics of his artistic profession. He, therefore, remains comparatively unknown.

The scriptorium of the world's newest great city, Chicago, is a place of infinite interest to the bibliophile. Here is a museum of the writing art valued at many thousands of dollars and here also the ancient craft of quill and compass is perpetuated and made adaptable to modern use. In executing the commissions received from the patrons of the modern scribe no clumsy, puerile imitations of the excellent work done by the craftsmen of the middle ages is permitted, but rather their best efforts are reproduced with astonishing fidelity. The head of this scriptorium has spent 30 years in learning, developing and teaching the art, and nearly every year he spends several

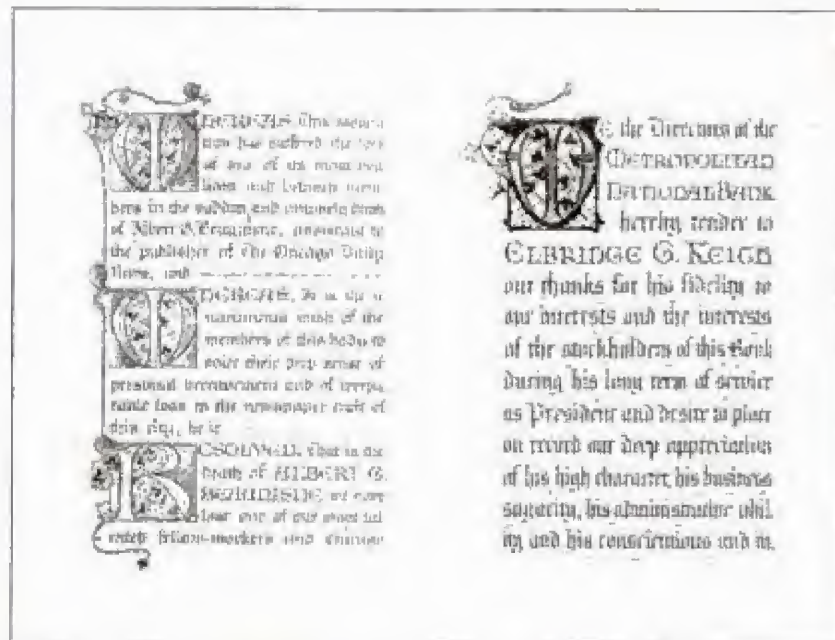
months in the libraries and monasteries of Europe examining and copying their most famous manuscripts. His collection of old books, and photographs and copies of ancient manuscripts is a magnificent one, representing the growth of the art in all sections of the British Isles and the Continent. On one of his tours he asked permission to photograph a famous work done in gold leaf. This was refused; whereupon he begged leave to copy it. The incredulous monks, declaring that an impossibility, reluctantly granted permission. They marveled greatly when the visitor from America produced a copy that for exactness of line and beauty of detail equaled the original. In other cases photographs have been made and filled in with the colors of the old manuscripts.

In his researches this modern scribe has established the theory, which may prove surprising to many, that the work of the scribe did not languish immediately upon the introduction of printing but, on the contrary, he says, there is indubitable evidence that the art reached its zenith after Gutenberg's invention had become a commonplace throughout Europe. Competition, then, as now, proved the stimulus to a perfected product. Eventually it had to succumb save for the isolated instances that may be found in all civilized countries, of which the Chicago scriptorium is one.

It is his belief that the illumination of vellum as a distinctive art originated with the monks of Ireland as early as the eighth or ninth century. The

simple scribe, of course, is an institution older than history, coincident with the dawn of human intelligence, when a scratch on a stone told a story. From the ancient symbolism or "picture writing" of man in his most primitive state, the art of expression by written forms has progressed from the hieroglyphics and papyrus rolls of Egypt to present-day multiple presses and linotype machines. Vellum took the place of papyrus at an early period, the oldest vellum manuscript extant being a fragment of Demosthenes' philosophy. Vying with it in venerable age are the codices of the Bible and a Latin manuscript of Virgil of the fourth century.

Marked changes have taken place in the development of penmanship. The Lombardic was one of the earliest of the so-called "national hands"—letter forms that assumed gradually an individuality according to the



Examples of Work of the Modern Scribes

locality in which they held sway. The Lombardic had its origin in Italy and developed from the style of penmanship which was practiced, from the ninth to the thirteenth century, in the monasteries of Monte Cassino and La Cava. What eventually became the Irish and Anglo-Saxon style was brought to Ireland by missionaries from southern Europe in the sixth century. The famous Book of Kells, produced in Ireland in the seventh century, is a work notable for its beauty of ornamentation. The Irish hand found its way into the northern part of Britain and thus the English hand is traced to the Roman.

A decree of Charlemagne in 789 A. D. for the revision of church books resulted in a reform of writing in France. This new and distinctive hand had its origin in the monasteries of Tours where, in the Abbey of St. Martin, under direction of Aleuin (or Alcuin) of York, much attention was given to writing.

Individual forms of script developed in various nations of Europe in the eleventh century. In the twelfth century the so-called Gothic writing appeared. There was a gradual decline of the art in the fourteenth century save for the renaissance in Italy where was developed a regular and beautiful style—the “humanistic” hand of the fifteenth century which had great influence on the later type forms.

Up through all history the scribe has proved an important factor in human activity, but to the Irish monk should be given the credit of bringing the work of the writer up to the standard of a fine and high accomplishment. He it was who established monasteries in many remote corners of Europe and carried with him his art of beautiful scripts, teaching it in widely scattered communities.

Not only is a peculiar skill required in the work, but immeasurable patience as well and mathematical exactitude. Its ancient perfection is proof of the dictum, realized keenly in those somnolent centuries, that “art is long.” Ten thousand strokes of the quill, years and decades of labor, were counted as naught: the end of art justified the time expended and the toil.

In the collection of the Chicago scriptorium are splendid examples of the writing art extending from the eleventh century to the present. It is indeed a veritable museum of writing, including, besides the manuscripts, an assemblage of working materials that is the delight and despair of antiquarians abroad, though little known here. Lying beside a bit of dimly ruled vellum, 600 years old, is the ruler that traced the lines—a dull-pointed bit of iron found in Florence, discarded by

the monks centuries ago. Here are Greek and Roman styli, used for blocking vellum in squares, one marked with the sign of the early Christians and carved as delicately as if turned from a wheel. There is an inkhorn of 1350, probably the oldest in existence, with compartments for ink, sand (used in lieu of blotting paper) and pens; and in the case is a quill of the fourteenth century, wrinkled and useless. The foregoing are shown in the accompanying photograph with a Venetian inkpot of the fourteenth century, and other tools of the craft.

Among the precious relics is an ancient bloodstone-tipped implement used for burnishing gold leaf. This is about 600 or 700 years old and is one of the gems of the peculiar collection. Other burnishers are fitted with wood, brass and agate tips. A writing case from Arabia is of brass, beautifully decorated in repoussé work; on a shelf below is a copybook on vellum done by Ulrich Hoffman, at Nuremburg, in 1660. Each page written by this great quill artist is a master work.

A compass of 1425, a fifteenth-century Florentine master-printer's seal, a sand sprinkler and tray of Siena, 1400, quill sharpeners 200 years old, and miscellaneous antiquities having no relation to the art of writing, all claim the attention of the visitor to the scriptorium. He is assured, too, of the genuineness of each object by the veteran scribe and illuminator whose third of a century of research has fitted him to detect the clever imitations foisted on the unsophisticated in all markets of the antique. According to this expert, there are in Europe today 226 manufacturers of fake antiquities.

Much of the work of the present day is done with the same implements and materials that were used hundreds of years ago. Quill pens are fashioned by old time steel cutters made for that purpose; the strange inks are mixed, the gold leaf is burnished; civilization, with all its progress in invention, apparently cannot improve upon the essentials of the art as employed when

the monasteries were in their prime. India ink, as an instance, is a staple of the artist in black and white today as it was to the monk of centuries ago. Many and vain have been the attempts to wrest from the Chinese the secret of its manufacture, but its ingredients have been jealously guarded by the impassive, reticent celestial. Even his wily neighbor, the Japanese, failed in his effort to duplicate it. This much only is known about the composition of India ink—its base is cuttle-fish bone. Gray is produced by the combination of Chinese white with India ink; reds, greens, blues and other primary colors are imported from France. The gold used is of English preparation.

Most interesting of all the museum's treasures are the musty old tomes, the age-hallowed books that tell of the genius, the labor of love, the instinct for beauty that thrived in the dim light of monasteries. What pictures of medieval glory, pageantry and chivalry they conjure! And here at these

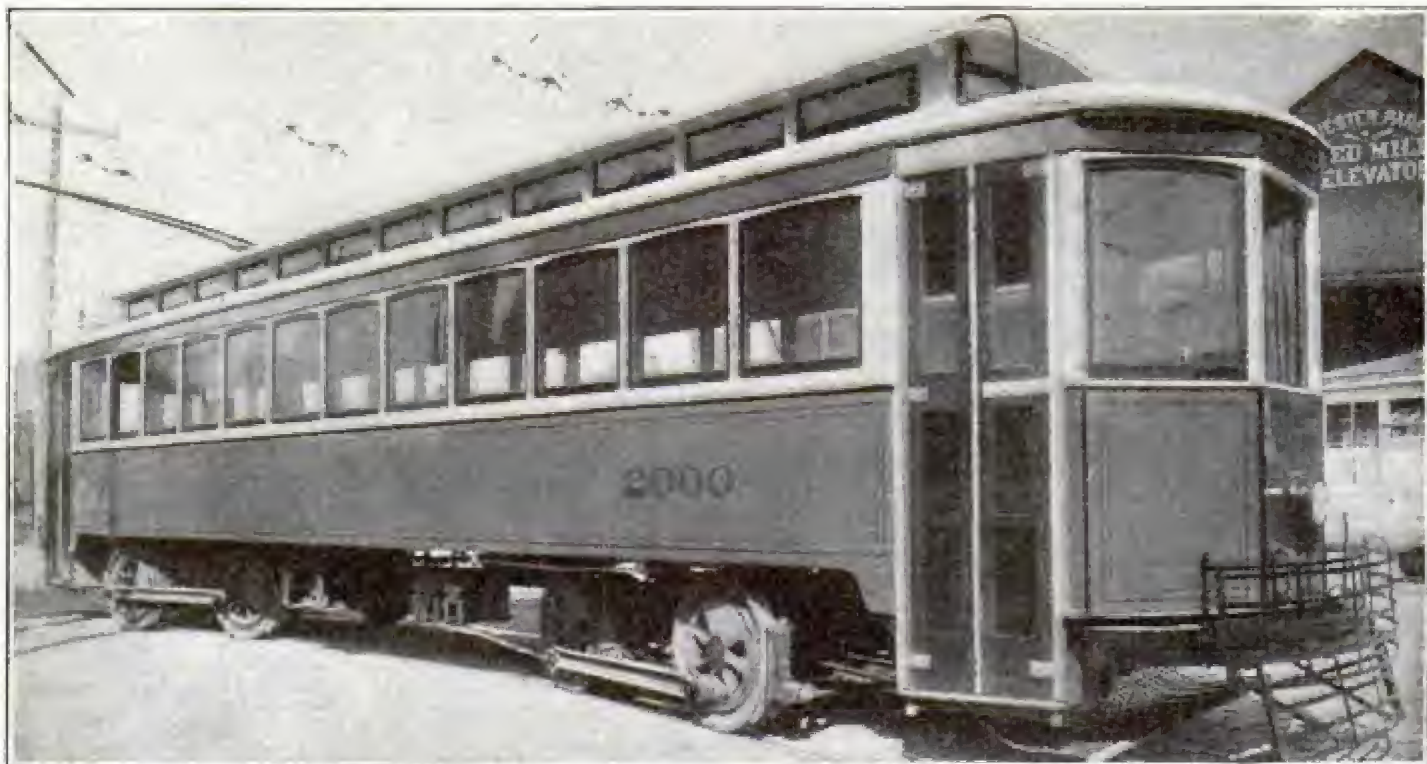
modern desks are men practicing the ancient profession.

One may ask, "Who are the patrons of the modern scribe?" They do not come from the philistines nor from those without much worldly goods. Rather they are of the rich who chance to be of esthetic temperament; those who revel in the beauty of antique things and who richly reward the modern scribe. Illuminated testimonials to those who have accomplished something of note, memorials to those who have left behind a record of work well done; engrossed resolutions, diplomas of schools and colleges, limited editions de luxe, significant texts and mottoes—these are only a few of the orders that the scribe and illuminator of today is called upon to execute on vellum or parchment in the manner of his illustrious predecessors. It is only just to say that he performs his work in a way to merit the approbation of the quiet craftsman of the middle ages whose manuscripts today are the delight of artist and antiquarian alike.



From a drawing by W. Dohrk, in *The Sphere*, London

The Modern Twins of Destruction—the Aeroplane and the Submarine



Driving-Rod Connection on Wheels Saves Extra Motor on Each Truck

RADICAL INNOVATIONS IN STREET-CAR DESIGN

A new type of street car, with wheels in each double truck connected with driving rods, much like a locomotive, is the latest innovation in street-car construction, just turned out by a well known American manufacturer. This new type of car is being tried out on Cincinnati streets and, so far, has been satisfactory in operation.

The idea of connecting the wheels by driving rods saves the necessity of using an extra motor in each truck. One motor to each truck now does the work of two as formerly used. The connection of the wheels tends to prevent them from spinning when the rails are slippery.

There are no sliding doors separating the platforms from the rest of the car. It is all interior after mounting the steps. The conductor, by means of a lever, opens the step doors for a passenger to enter and then closes them again, collecting the fare. Exit is from the front and rear ends. Seats for 25 persons are on each side while 50 more can find straps to hang to and another 50 can be packed in between.

The new type of car is said to be the solution of the problem of carrying the greatest number of passengers in one vehicle.

“They are brutes for driving their horses so recklessly,” is the burden of a charge by women of New Haven, Conn., who are trying to get the Humane Society of that city to cut down the speed of horse-drawn apparatus in answering fire alarms.



End View of Street Car Put in Service in Cincinnati

MOST PRIMITIVE WEAPONS NOW HOSPITAL AID

The old wife's advice that the hair of the dog was good for the bite thereof is about to have further exemplification in the retirement of a certain form of lance as a weapon of offense in the French army that it may be introduced as a part of the hospital-corps equipment for removing wounded from the field. The most primitive of warlike implements is thereby consigned to the lowly task of supporting the litters on which the fallen are carried to the hospitals. The armies of continental Europe have held to the lance as a weapon for a portion of their troops since very early times. The modern regiments of lancers carry them more as ornaments than anything else. It is now proposed to cut off the heads of the lances used by the French army in Morocco and issue them to the litter bearers of the medical corps. Each litter will be equipped to receive four lances at the four corners, so that the bearers can rest on their way from the field to the hospital, the lances being placed upright on the ground and the litter held on top of them. It is often as much as half or three quarters of a mile from the field of action to the nearest dressing station or hospital in Morocco and the carrying of a wounded man across the desert under a tropical sun is a severe task. The litter bearers, four in number, find it necessary to rest at frequent intervals and to prevent any chance of injuring the wounded man by lowering him from their shoulders, they are to be encouraged



Method of Carrying Lances When Not in Use



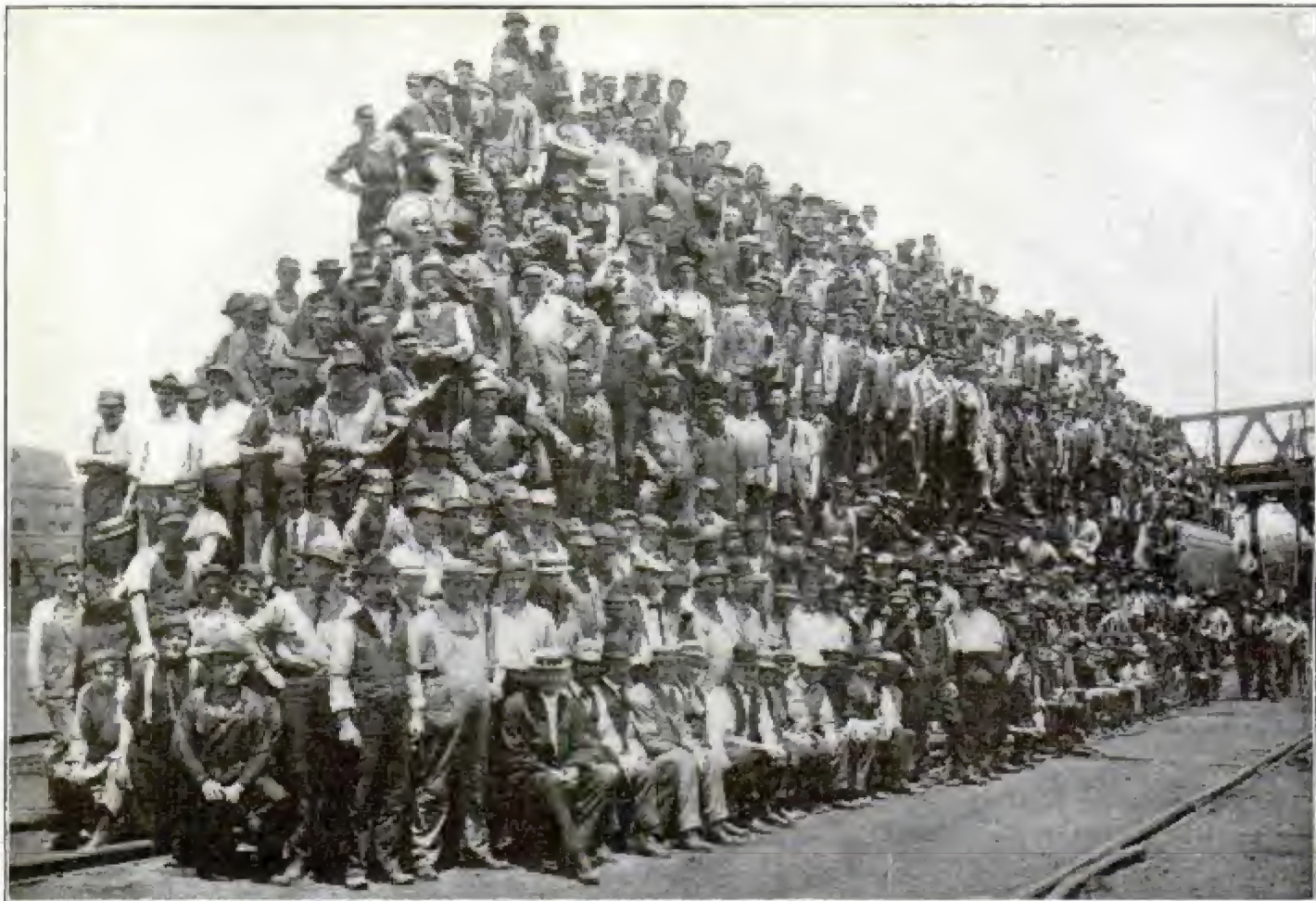
Using Lances as Rests for French Hospital-Corps Litters

to rest the litter on made-over lances. When not in use, the lances will be carried by the litter bearers.

AN EXPOSURE INDICATOR FOR FILM CAMERAS

Probably all users of roll-film cameras have had the experience of finding, upon developing the film, some much coveted view sharing its section of the film with some alien scene. A recent invention which will prevent double exposures has been patented by a Connecticut man. This is an attachment which will, upon operating the shutter, cause the word "exposed" to appear in an opening in the top of the camera. This word remains in sight until the film-winding mechanism is operated to bring a new section of the film into position behind the lens, when it disappears, thus indicating that the field is clear for another exposure. The device is entirely automatic, and requires no thought or attention on the part of the operator. It is applicable to either folding or box cameras.

Recent investigations of hygienic conditions of the air in the interior of a modern battleship, have proven that the air, even in the crowded sleeping quarters during the night, is much purer than in barracks and modern houses.



Courtesy Santa Fe Employees' Magazine

LOCOMOTIVE BANKED BY MEN WHO BUILT HER

The accompanying illustration shows the largest locomotive in the world banked by the men who built her in the Topeka shops of the Santa Fe Railroad. The men in the picture number 610, all of whom are machinists or machinist apprentices.

COOKSTOVE OF COBBLESTONES AND CEMENT

In order to give the picnickers in the parks a chance to make coffee and heat food and obviate the danger of

unextinguished camp-fires, the city of Los Angeles, Cal., has provided rustic cookstoves which are useful and ornamental. They are formed of the cobblestones which are very plentiful there, and with the addition of a little cement a durable and artistic little heating device is ready for outing parties. A sheet-iron top, large enough to accommodate the coffee pots of several companies of picnickers is provided. Fuel is plentiful, as the twigs and branches from trimmed trees are placed near by, and all rubbish, such as lunch boxes and papers is readily consumed, helping to keep the parks neat.



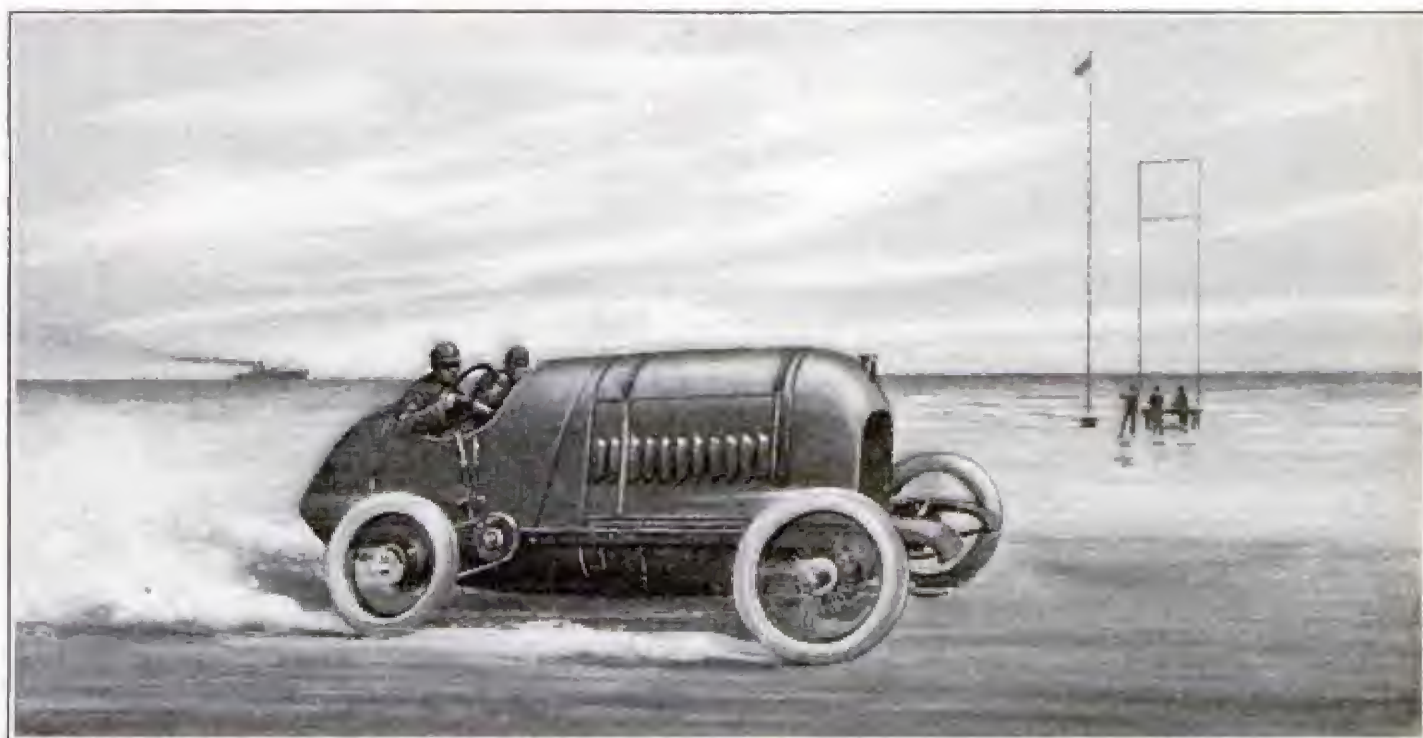
Cobblestone Cookstove at Picnic Grove

German winegrowers are being encouraged to scatter nesting material and erect houses for birds that the insects which are making great inroads on the grape crop, may be eventually destroyed.

POWERFUL ITALIAN AUTO WITH 300-HP. MOTOR

English motordom was considerably stirred by the appearance of a 300-hp. Italian car in the race meet recently held on the Yorkshire coast. This car was the most powerful that has been seen in England and under adverse conditions reeled off a mile at the rate of 116 miles per hour. The car made 125 miles per hour in an unofficial trial a day or two previous

it is impossible to start the engine by hand, so that it is necessary to have another car tow the monster a short distance, throw in the clutch until the engine is started by the revolution of the gears, and as soon as it is running well, throw out the clutch and bring the car to a standstill, thus leaving the engine running free. The motorist must be careful from then on not to



The 300-Hp Italian Racer on Yorkshire Beach, England. Negotiations were Being Made to Secure This Car for Lewis Strang, the American Racing Driver, Who was Killed in July

to its official performance. Because of its peculiar appearance, the car was dubbed the "Fire Engine" and was the source of considerable anxiety on the part of the managers of the meeting. The racing was held on the seashore, and on the way from Brooklands to the place of the meeting the powerful automobile became stuck in the sands and required the services of a seven-horse team to pull it out.

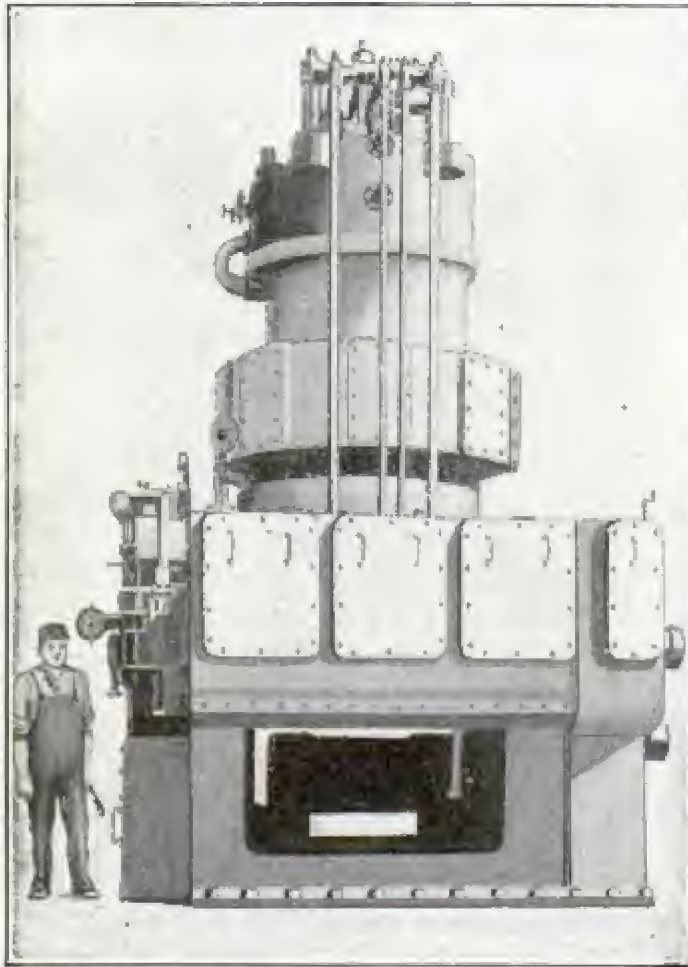
The car presents a peculiar appearance because of the great height of its bonnet, the top of which is 6 ft. from the ground. The exhaust ports are very large and when the engine is running at full speed, the exhaust is a sheet of flame flaring out frequently as much as 2 yd. square. The compression of the engine is so great that

permit his engine to go "dead" or he will have the towing process to go through with again. When the great car was making its attempt to lower the mile record, everyone near the course on the ocean sands fled to the surrounding cliffs as fear was expressed as to just what might happen when the powerful engines were properly tuned up. The fears were groundless, however, and the car is expected to make a big showing as soon as the drivers become familiar with its work.

Preparations are being made at Lyons, France, for an elaborate celebration of the 150th anniversary of the establishment of the first veterinary school in the world.

LARGEST TWO-CYCLE MOTOR EVER BUILT

The largest two-cycle, internal-combustion engine ever built, and probably the largest single-cylinder motor



The Kind of Motor that Will Shortly Be Used in British Naval Vessels. It is the Largest of Its Kind in the World

in the world, is shown in the illustration. This powerful machine is rated at 1,200 hp., and such is its size that the crankpin is more than 2 ft. in diameter. This engine has been constructed by an English concern merely for experimental purposes, and is the prototype of many others that are under order for the British navy. The man in the photograph is 6 ft. tall.

THE VERSATILE BUFFALO IN DARKEST CHINA

Compared with the horse that Shakespeare's Richard III called for with an earnestness that has resounded through the ages, the water buffalo is a heaven and earth combined to the primitive agriculturist of backward China. This patient, long-suffering

bovine is both horse and cow to the local farm, for besides supplying the family with milk the buffalo grinds the rice into flour, pulls the plow, hauls the loads, and even raises the water to irrigate the fields.

The way in which this irrigation is carried out is interesting. The water-raising machines are primitive affairs of wood, and comprise long chains of paddles running from the water to a wooden shaft fitted with wooden gears and turned by the buffalo. The animal plods around and around in slow, monotonous circles, being blindfolded to prevent dizziness. On the poorest farms, the buffalo is superseded by hand labor, which is very cheap, two men lifting the water by means of closely woven scoops of bamboo. It is said that two men, working ten minutes at a time with intervening rests of five minutes, can elevate 1,500 gal. of water an hour.

A COMPUTING OIL PUMP

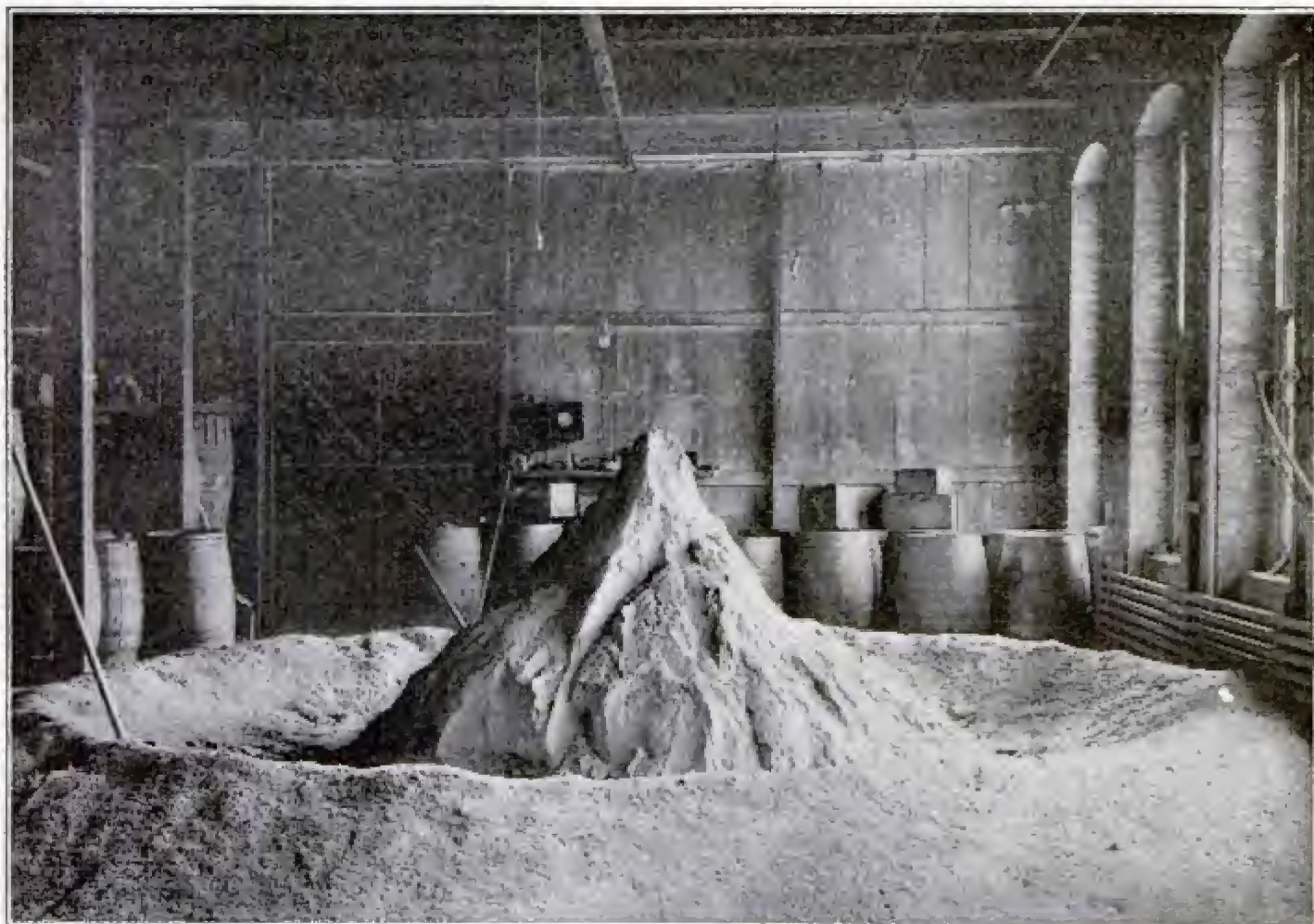
An oil pump, especially designed to prevent waste through leakage, and fitted with an automatic computer, is being marketed by an Indiana manufacturer. The illustration shows the



This Oil Pump, Designed for Retailers, is Provided with an Automatic Computer

transfer of oil from barrel to tank, the pump registering the exact amount taken from the barrel. By disconnecting the hose and closing the valve, the pump is made ready to draw the oil from the tank as wanted. The automatic computer arrangement measures the exact amount of oil pumped.

thrown by centrifugal action to the inclosed outer end of the cup, and fills the feeding tube. The cup can be removed, filled and replaced with the pulley in any position. One filling lasts from one to three weeks, according to the work imposed on the lubricator.



A Pile of Finely Ground Silver Sweeps in the Process of Mixing

A customer, for instance, wishes 15 cents' worth of oil selling at 19 cents per gallon. No matter what the price of oil per gallon may be, the computer will indicate exactly when to stop pumping to deliver the required amount.

AUTOMATIC LOOSE-PULLEY OIL CUP

An automatic loose-pulley oil cup, which feeds oil only when the pulley is in operation, has lately appeared on the market. The oil cup consists of two main parts, an inclosed outer cup and a feeding tube leading from its outermost end to the shaft journal. When the pulley is rotating, the oil is

RECOVERING SILVER FROM SWEEPINGS

In the manufacture of silver wares the loss of silver in floor sweepings would be great were it not for the methods of recovery. The smelting of sweeps requires a special plant which but few concerns can afford to have, therefore most of them prepare this material so that it can be sold. The most satisfactory method is to grind the sweeps to a fine powder so that a fair sample can be obtained for assay. One assay of the material may then be made by the purchaser and another by the seller. Unless the sweeps are ground very

fine, however, and then mixed thoroughly, there is but little chance of agreement between the two assays,

as coarse material is filled with fine shot silver which, when samples are made, is not evenly distributed.

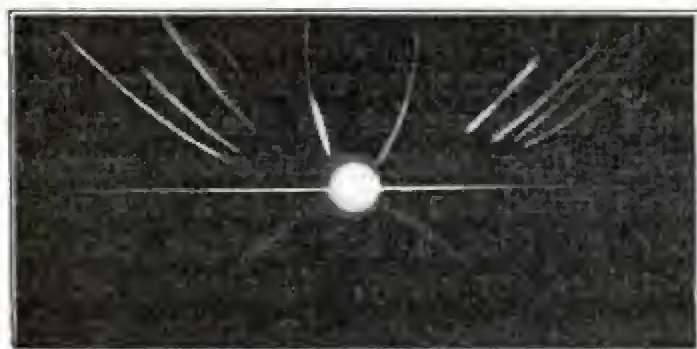
MOST SENSITIVE METHOD OF CHEMICAL ANALYSIS

When Kirchhoff and Bunsen, away back in 1859, found that from the appearance of the peculiar bands of color produced in the spectroscope by light-giving sources they were able to detect and identify the chemical elements in the sun and other far-off bodies, it was supposed that the limits of possibility had about been reached in this branch of physical and chemical research. But recently there has been discovered a still more sensitive method, which reveals the presence of almost infinitely small quantities of gaseous or radiant matter that would be impossible to detect, much less identify, by the most refined processes of spectroscopic analysis. In fact, it is supposed that eventually the new method will lead to an explanation of the processes involved in the disintegration of one elementary substance into another, such as occurs in the case of radium and its various emanations, as well as affording the chemist an actually visible insight into the mysterious processes of chemical action.

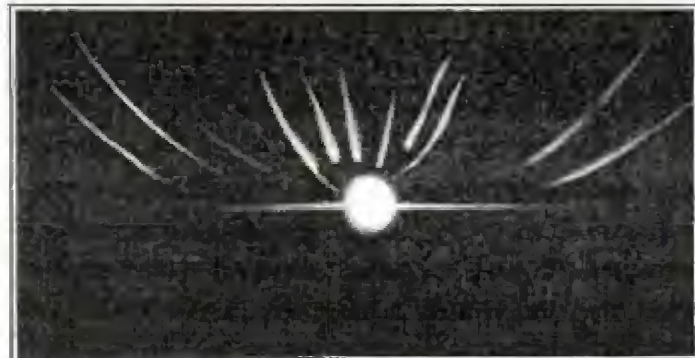
This new analysis is the discovery of Prof. Sir J. J. Thomson, the famous English physicist, and was evolved in the course of his researches on electrical discharges in tubes containing highly rarefied gases. The phenomenon discovered by Thomson, which led to the new analysis, is one which

accompanies the production of the so-called cathode rays under certain conditions. These cathode rays are the negatively electrified particles which are thrown off from the cathode or negative terminal in a highly exhausted or vacuum tube when an electric discharge is passed through it between electric terminals. Under ordinary conditions they move in straight lines, but may be deflected from a straight path by the influence of a magnetic or electric field. When they are caused to strike against solid substances they generate Roentgen or X-rays.

Thomson found that when the cathode or negative terminal in an exhausted tube (through which an electric charge is passed) is pierced with holes, there appears another group of electric rays which are given off by the positive terminal or anode, as it is called, and that these consist of positively electrified particles which are much larger and which move more slowly than the so-called electrons or ions which constitute the cathode rays. These also move in straight paths and are capable of deflection by electric or magnetic fields, and Thomson found that when they are so deflected and made to fall on a sensitized plate, they will register photographically their point or points of impact, accord-



1 Parabolic Spectrum of Nitrogen Mixed with Argon



Parabolic Spectrum of Carbonic Acid Gas



Florist Witterstetter at Work with His Brush Artificially Pollenizing a Carnation Bloom

ing as the rate of movement of the particles is constant or varying. It is this phenomenon that Thomson has turned to account as a means of detecting and identifying chemical elements, whether they occur singly as atoms or grouped as molecules. For the amount of deviation of the photographic record is an infallible and invariable measure of a certain chemical property—the atomic or the molecular weight, as the case may be—of each constituent particle.

The new analysis has been called the "parabolic spectrum" method, from the form of the photographic records and its similarity to spectroscopic analysis. By means of this method, Thomson has been able to detect and identify as small a quantity as the one 700-millionth part of a grain of a substance when the spectroscope absolutely failed to reveal its presence.

POLLENIZING CARNATIONS WITH A BRUSH

Assisting nature with a little paint brush and creating new flowers mechanically is what a florist is doing in Cincinnati.

Where a small pink once bloomed

the little camel's-hair paint brush has made a mammoth carnation bloom. Single blooming varieties are transformed into double ones with a little patience by this magic brush. Even colors are changed.

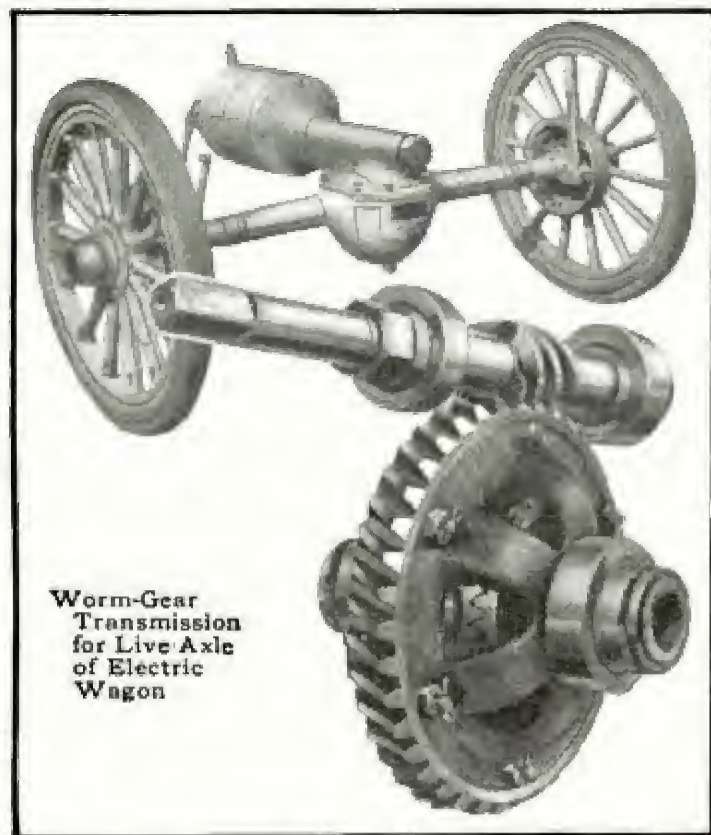
This wonderful work is going on under glass and wire screening, for should a busy little bee or other honey-seeking insect ever invade this private sanctum, the fairy work of the little brush would come to naught.

For years R. Witterstetter, a florist, has been experimenting in the control of flower pollenization, and, by doing the work himself with the aid of his fine little camel's-hair paint brush and a small, powerful magnifying glass, he has succeeded in growing a new double pink carnation that blooms as large as a big rose. Another group of plants has a delicate salmon pink color, but this unusual color, he says, is not "fixed" as yet, and the blooms have a tendency to revert to the colors from which the salmon pink was derived.

¶ There are still 1,714 sailing vessels, aggregating 1,121,814 tons register, engaged in foreign trade under the American flag.

WORM-GEAR DRIVE FOR AUTOMOBILES

During the past year or so, European automobile manufacturers have been regarding with increasing favor the worm-gear drive for their cars,



Worm-Gear
Transmission
for Live Axle
of Electric
Wagon

with the result that many of the leading firms have adopted this form of transmission as standard. American concerns are now watching closely this recent development, and already

one prominent manufacturer of electric wagons has devised a form of worm-gear drive that is giving splendid results in practice.

In a paper by E. R. Whitney read before a recent meeting of the Society of Automobile Engineers, at Dayton, Ohio, it was claimed that contrary to a widespread opinion which exists even among engineers, the worm gear is superior to other forms of drive for motor-driven vehicles, within the scope of its legitimate field, on the score of efficiency, durability and simplicity. A series of experiments carried out by Wilfred Lewis, a well known American authority on gears, showed the maximum efficiency of a worm gear like that here illustrated to be 93 per cent, which corresponds to an extremely small friction between the worm and the worm wheel. The thread of the worm had four turns, the average angle of the thread being 28 deg. The worm was of the variety known as Hindley's screw, that is, it was shaped like an hourglass to fit the curvature of the worm wheel. Such a construction is of course expensive. The "life" of such a gear was estimated at about 60,000 miles.

SNOWFALL AND EVAPORATION STUDY

By L. WILLIAM THAVIS

The United States Weather Bureau is engaged in conducting an important investigation of a practical kind in two directions. One is with an apparatus for catching and conserving the snowfall in remote mountainous sections for the determination of the season's snowfall in the form of its water equivalent. The second is an investigation of the laws of evaporation over lakes and storage reservoirs wherein the snow water from the mountain peaks is held for distribution by irrigation during the summer. These two problems have assumed unusual significance in recent years in connection with the devel-

opment of the great irrigation projects in the Rocky Mountain and Pacific states, and the power plants in the mining districts.

The amount of snow in the high mountains varies greatly from year to year in consequence of the great currents of moisture-bearing winds, which deposit more or less snow and rain. If there is much snow in the mountains, the rivers, reservoirs and ditches will be abundantly supplied; if there is comparatively little snow in the high levels, then the irrigation engineers must economize all along the line. If a contract is made to supply so many



Tower for Studying Evaporation in Mountainous Regions



Observation Tower Used on Ocean for Studying Moisture

acre-feet of water to a given district and water is not available on account of the causes in the great atmospheric circulation beyond man's control, it is important for the engineer to have his figures of probable water supply be-

fore signing the contract. This water once spread out in a great storage reservoir loses a large mass by atmospheric absorption, especially in the arid regions of the West.

Water may evaporate from a pan at



Observation Station and Tower for Inland Studies of Evaporation

a rate of anywhere from 10 in. to 200 in. a year, according to the circumstances, and for a given reservoir in a particular climate the annual evaporation will be a certain number of feet. In the humid states of the East, the reservoirs lose by evaporation from 2 to 4 ft. of water; in the arid western states, similar reservoirs would lose from 4 to 7 ft. of water; the open irrigated land would lose from 6 to 10 ft., and some small elevated areas might lose even 15 ft. of water annually.

When an engineer goes into a new country to construct a reservoir, he wishes to know the general climatic conditions, the temperature, the humidity, and the prevailing wind velocity, that he may determine how much water will be lost by evaporation before he begins to build the dam. If the dam is too high and spreads out the water over too great an area, there will be too much loss by evaporation; if the dam is too low, its storage power will not be great enough for practical purposes.

The engineer needs such information

in planning the dam for the project and the network of dependent distributing canals. Similarly, for power sites, there is an economic connection between mountain snow supply and electric or waterfall distribution. The forestry service has much interest in the relation of the growth of trees on the mountains to the moisture-bearing winds; and the bureau of plant industry has a strong reason for studying soil evaporation and plant transpiration. Hence it is easily perceived how wide a field of scientific research is open to the government bureaus connected with this co-operative work.

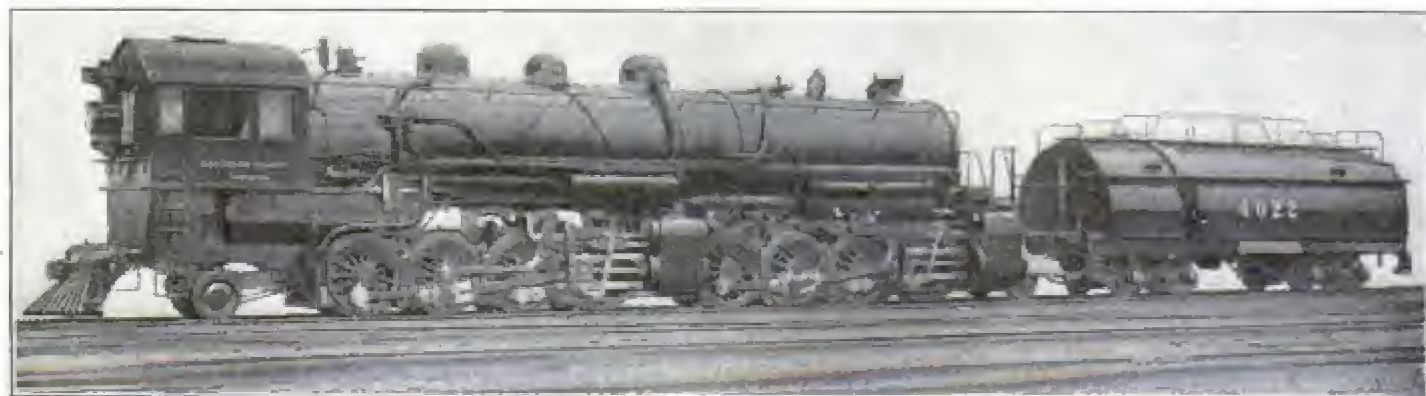
At present this vast field of investigation is occupying the serious attention of five great bureaus of the federal government, and practical information is being furnished the people to insure against unwise expenditures and improvident projects.

Apparatus for making these scientific studies are mounted on towers, ranging from 10 to 50 ft. in height, and at least 200 observation stations are maintained both inland and at sea.

OIL-BURNING ARTICULATED LOCOMOTIVES

The articulated or Mallet type of locomotive, which combines flexibility with great size and strength by having two separate sets of engines and driving wheels on separate trucks, has up to recently been made only with coal-fired boilers, but the latest engine of this class, of which twelve have just been built for a western railroad, has been equipped with oil-burning boilers.

In opposition to the usual run of locomotive design, this monstrous engine runs firebox end first, a feature which enables the crew to have an unobstructed view of the track ahead. Among other modifications from previous practice, the new Mallet has two steam domes, a supply of dry steam being insured by locating the throttle valve in the front dome and by draw-



New Oil-Burning Articulated Locomotive with Tender for Oil and Water

ing the steam for the cylinders from the rear dome through two internal pipes each 6 in. in diameter.

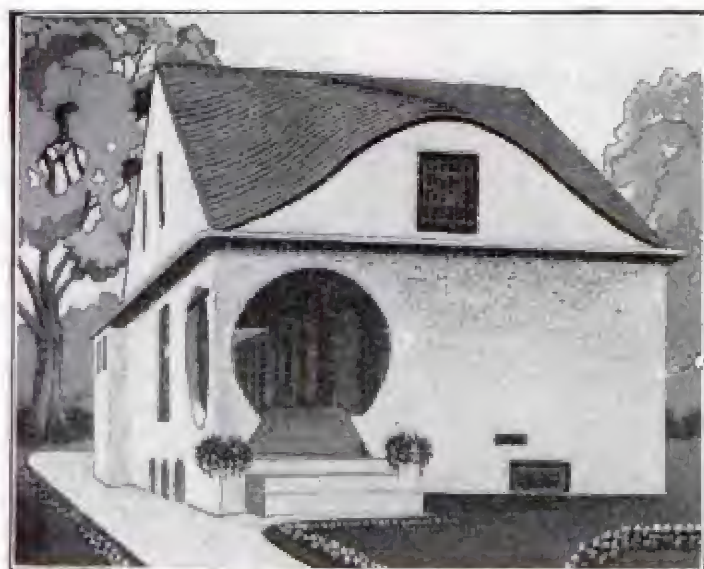
The tender comprises two semi-cylindrical tanks, the forward one carrying 3,200 gal. of oil and the rear one 10,000 gal. of water. The steam pressure is 200 lb. per square inch, and there is a reheater in the smoke box. The locomotive weighs 432,600 lb. alone, and the combined weight of engine and tender is 612,600 lb., or over 306 tons.

RADIOACTIVE SNOW

In the course of a recent investigation in France on the radioactivity of snow, it was discovered that freshly fallen snow is highly radioactive but that it loses its radium-like properties after about two hours. Snow that fell on soil seemed to retain its radioactivity longer than when it fell on roofs.

CONCRETE HOUSE HAS A "KEYHOLE" ENTRANCE

This oddly designed concrete plaster house, located in Los Angeles, attracts considerable attention. The entrance, which is the only aperture in the first-story front wall, is shaped like a keyhole, and because of this the structure is called "the keyhole house."



Courtesy Cement World

Called "The Keyhole House" Because of the Odd Shape of Its Front Entrance

FREIGHT ELEVATOR ON APARTMENT HOUSE

Several of the large modern apartment houses in Berlin are equipped with external freight elevators, usually



Exterior Freight Elevator on an Apartment House in Berlin

located in the court yards with which German apartment houses are provided. These outside elevators are used by the tradesmen in delivering goods, and for the removal of garbage.

It is interesting to draw attention to the artistic qualities of the wall facing on this interior court as compared to the interior courts of the majority of American apartment houses.

George Prentice, in Northboro, was recently married to Miss Mary De Witt, in Blanchard, by the Rev. H. B. Minton, in Coin, Ia., by means of the telephone, the bride and bridegroom, each holding a phone, answering the customary questions of the minister and hearing him pronounce them man and wife.

LIVE TIGERS USED AS MODELS

Four bronze tigers, perfect counterparts of the king of the jungle, only larger, have recently been placed in



One of Four Bronze Tigers

position on the parapets of the Sixteenth Street bridge in Washington, at a cost of \$10,000.

The sculptor, A. Phimister Proctor, of New York, spent 18 months in fashioning the tigers, drawing his model from a former terror of the wilds, the property of a circus. The sculptor chose the circus tiger because it appeared to him the most perfect specimen obtainable. For two months he traveled with the circus, devoting his entire time to the tiger. Many sketches of the animal were made in various poses, followed by a rough clay model, then a quarter model in bronze, and eventually the finished model.

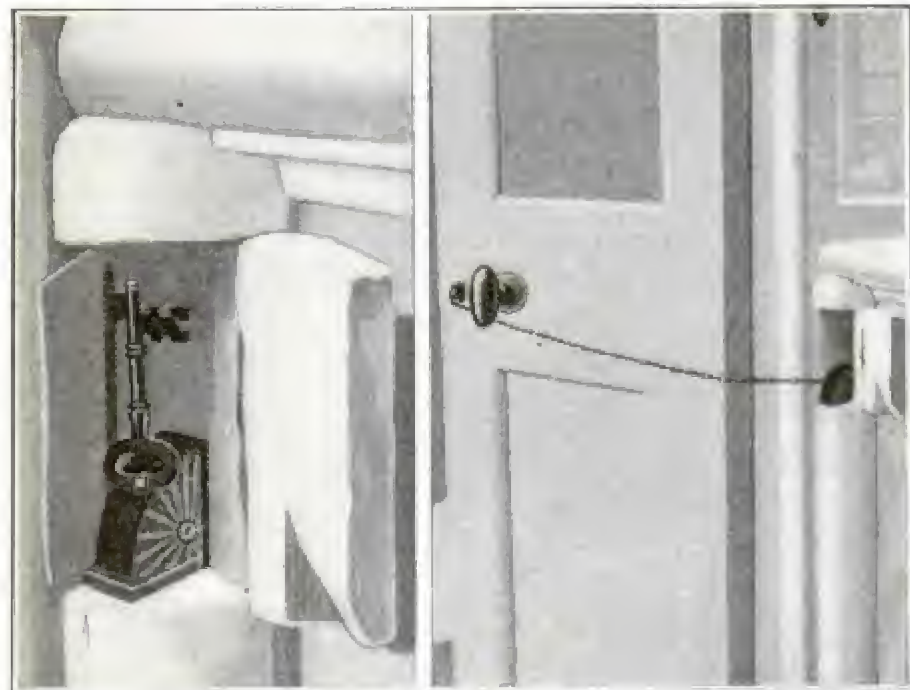
The tigers are hollow, and even at that weigh 1,550 lb. each.

Sixteenth Street bridge, on which the bronze tigers have been placed, spans a ravine 75 ft. deep, and is part of a magnificent boulevard, nearly five miles in length, extending from the White House to the border of the District.

INGENIOUS FIRE-ESCAPE KEY ARRANGEMENT

Although the fire-escape doors in the Irish Lace Depot at Dublin are kept locked while not in use, they may be

Cut in the wainscoting by the side of each fire-escape exit is a small door opening into a deep hollow in the wainscoting. In this is a pulley, and the key is attached to a weighted chain which runs in the hollow woodwork. This chain is just sufficiently long to allow the escape door to be opened to its fullest width with the key in the lock, and immediately the key is removed the weight at the end of the chain draws it back into the box again.



Fire-Escape Key Always Available because Chained to Opening Door and Kept in Wainscoting

always opened at a second's notice because of the ingenious method of assuring the presence of the keys.

Owing to the fact that fire-escape doors are rarely used, there is always the danger that the keys may become misplaced, and many firms adopt the system of enclosing them in glass fronted cases. This system is not applicable, however, for factories where the fire-escape

doors are occasionally used for other purposes, as is the case in the lace depot, where the landings are used for drying purposes and for photographic printing.

on the market by a New York concern. It is threaded into the cylinder head and is used in place of the ordinary petcock for priming-cup purposes as well as for an alarm. When



Bird Pets on a British Naval Vessel Brought on Deck for an Airing

BIRDS IN CAGES PETS ON BRITISH BATTLESHIP

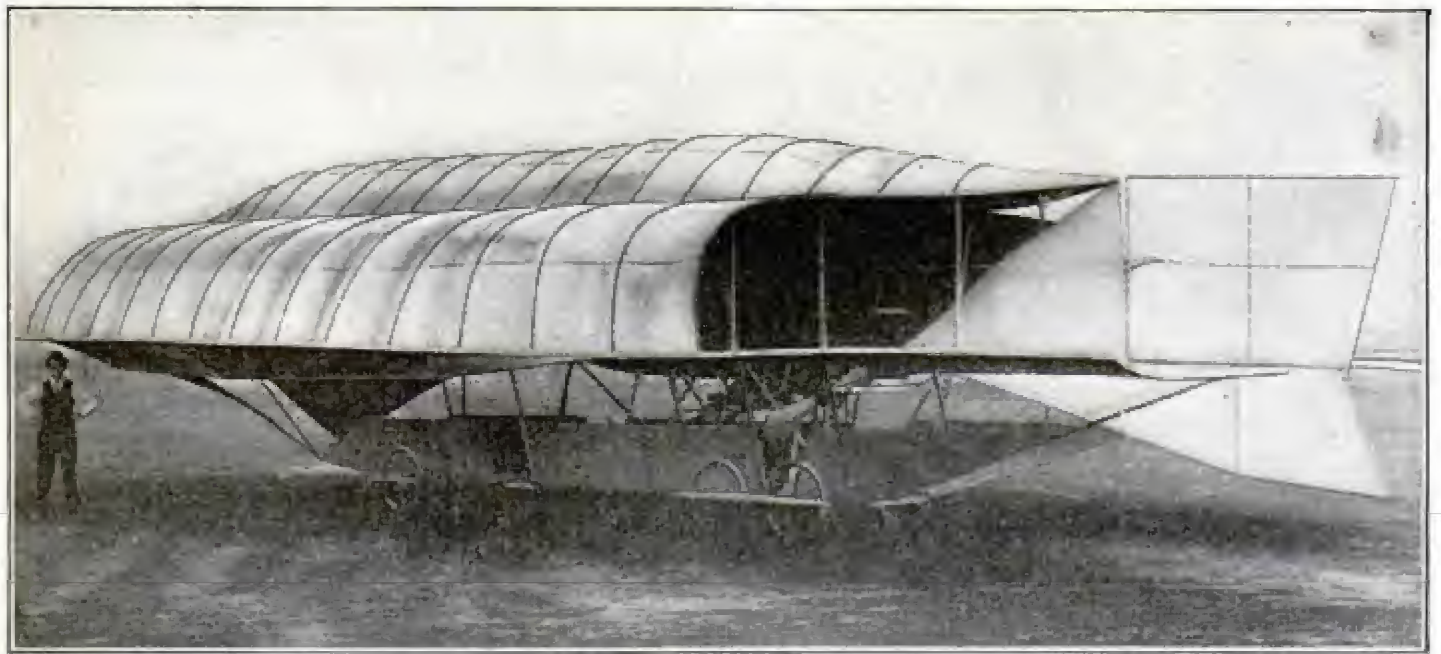
British sailors have pets of all sorts, but on at least one ship birds are kept instead of dogs, goats or monkeys. These birds are carefully tended by the members of the crew and their existence is officially recognized by the officers in charge through the allotting of special time for the airing of the birds and the cleaning of the cages.

OVERHEAT WHISTLE FOR AUTOMOBILES

A device which resembles an ordinary petcock, but which whistles when an automobile motor becomes overheated, thus drawing the attention of the driver to the fact, is being placed

a motor heats up beyond a safe running temperature, the brass valve spindle of the mechanism expands and elongates at a quicker rate than the steel pin that passes through it. Although the brass valve remains closed, this difference in expansion provides a passage for the hot gases to the whistle, causing it to give mild blasts, which can be easily heard by the driver of the car.

⌈The largest cantilever crane in the world, recently made by a British firm for a Japanese dockyard, is capable of dealing with a load of 200 tons at a radius of 95 ft. A still larger one is now being built for the Japanese navy, to have a load capacity of 200 tons at 105 ft. radius.



An Aeroplane of Unique Design Constructed by a Florist of Hackensack, N. J.

A CANOPY-TOP AEROPLANE

This curious aeroplane was designed and built by a Hackensack, N. J., florist who believes he has struck the right idea in aeroplane construction. The most unusual feature is the can-

opy top, extending the whole length of the machine, and intended to act as a parachute in case it falls. The machine is 50 ft. long, has an engine of 75 hp., and weighs 1,200 lb.

A "HEADLESS HORSE" PHOTOGRAPH

This horse really has a head, but a moment before the camera was snapped he swung it around to dislodge a fly or investigate some other source of irritation. The amateur photographer who took the picture did not give this movement of the horse

any thought at the time, and consequently was much surprised on developing the plate to find the animal headless.

THE OMNISCIENT ENGINEER

In Jules Verne's story, "The Mysterious Island," which enchanted the boys of a generation ago, the hero was an American engineer who was a walking encyclopedia of technical knowledge relating to every art and industry. He had a correct answer for every question, and promptly found ways of escape for himself and his comrades from every difficulty.

Unfortunately, such engineers live only in fiction, says the Engineering News, but there still persists in the minds of many people a lingering idea that a great engineer necessarily ought to know everything on every sort of technical matter. It is often humiliating for an engineer to run against this idea, particularly when one finds it in one's own family! A man whose



This Horse Swung His Head around a Moment before the Camera was Snapped

engineering reputation extends across the continent, for example, may be informed at the breakfast table some morning that the hot water drawn into the laundry tubs is so red and muddy with iron rust that the week's washing cannot be done. It is humiliating for the great engineer under such circumstances to have to weakly confess that he neither knows why the hot-water supply so misbehaves nor what to do to remedy it. He has an uneasy conscience that those of his own family who ought to most respect him have their faith in his greatness sadly shaken!

HOW TO MAKE A PEDESTAL

The pedestal shown in the accompanying illustration is another piece of furniture that can be made in the mission style. It is very simple in design and construction, and can be made by anyone who has a few simple tools and a slight knowledge of their use. It is best to make it of quarter-sawed oak as this is the most easily procured wood and also looks the best when finished. If you

order the material from the mill ready cut to length, squared and sanded, much hard labor will be saved. Following is a list of the material needed:

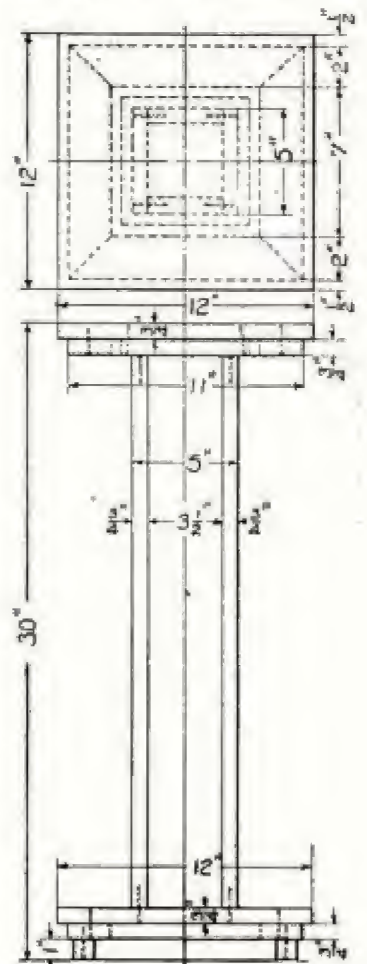
- 1 top, $\frac{3}{4}$ by 12 by 12 in., S-1-S.
- 1 bottom, $\frac{3}{4}$ by 12 by 12 in., S-1-S.
- 8 pieces, $\frac{3}{4}$ by 2 by 11 in.
- 2 sides, $\frac{3}{4}$ by 5 by 26 in., S-1-S.
- 2 sides, $\frac{3}{4}$ by $3\frac{1}{2}$ by 26 in.
- 1 piece, $\frac{3}{4}$ by 6 by 6 in.
- 4 blocks, 1 in. square.

Having the boards for the post cut to the proper length and square, nail

them together as shown in the detail drawing. Use finishing nails, then set the heads and fill the holes with putty. Next, nail the $\frac{3}{4}$ by 6-in. piece on one end of the post leaving the edges projecting even on all sides. Pick out the best board for the top. On the under side and $\frac{1}{2}$ in. in from the edges, nail four of the $\frac{3}{4}$ by 2 by 11-in. pieces which have been previously mitered as shown in the plan view. Now fasten this top to the post by nailing through the projecting edge of the top piece into the top board. Be careful to get this top on square with the post and exactly in center.

The bottom board is made in the same manner as the top board and is nailed to the lower end of the post as shown. Four 1-in. square blocks should be fastened to the bottom for the pedestal to rest on.

When complete sandpaper smooth and apply any one of the many mission stains that are supplied by the trade for this purpose.



NEW COLOR-PERCEPTION LANTERN

Really scientific color tests are made possible by the use of this new British color-perception lantern. By an exceedingly ingenious arrangement, a wide range of colors, scientifically true to the spectrum, can be produced as they would appear to the engineer at distances varying from 3,000 ft. to a comparatively close range. The effect of distance is made possible by means



The Light Reduced to Represent Distance of 3,000 Ft.

of modifying glasses set before the source of light and by reducing the size of the light by turning a disc provided with different-sized holes. Lights as seen in rain and fog are produced by means of ribbed glass for the former and ground glass for the latter.

Around the edge of the small revolving disc mounted near the top of the dark board of the lantern are five holes, ranging in size from the large hole used to produce the effect of a light comparatively close at hand to a hole which



Photos Clarke & Hyde

Operating Lantern; Second Largest Hole in Position

produces the same light the size it would be seen by the engineer at a distance of 3,000 ft. The two largest holes are for close range, the third in diminishing size produces the effect of a distance of 1,800 ft., and the fourth gives the effect at 2,400 ft. The person whose color vision is being tested stands about 20 ft. from the lantern.

This new device is being used for the British admiralty tests, and has also been adopted by several railroad companies.

CHEAP CONSTRUCTION FOR TALL CONCRETE WALLS

The cost of building tall concrete walls has been greatly lessened by a new form of construction, recently adopted in erecting a building for a Chicago brewery company, in which the forms are made so as to slide up the wall continuously as the concrete is being poured. It has been calculated by an authority on concrete construction that the new method is materially cheaper than other systems for walls above 18 ft. in height, so that it is especially applicable for elevators,

silos, storage bins and warehouses having high straight walls.

The forms are raised by jacks which straddle the wall and support the forms against it. The forms, which are about 4 ft. high, are bolted or spiked to the legs of the jacks, and are lifted by screws working against pipes placed in the poured wall. On straight walls, without window openings or floor recesses, about 3 ft. of wall can be poured in a working day of 8 hours. One laborer can attend to from 9 to 11 jacks, and the entire force is organized as a unit so that all the jacks will be raised equally.



A Water Heater

In places where the bath room adjoins the kitchen, and the gas stove and tub are in close proximity a simple and cheap bath-water heater may be arranged as shown in Fig. 1.

Make a cone-shaped coil similar to an old-fashioned beehive of $\frac{1}{2}$ -in. copper pipe. The base should be 8 in. in diameter to fit detachably over the stove burner. At the ends insert a garden-hose connection and solder in tightly. Connect the coil to the sink faucet with a piece of garden hose of the right length having the usual connections at each end. Use a similar piece of hose to connect the top of the coil with the bath tub. An efficient and continuous flow of hot bath water may be secured with this coil.

A piece of galvanized iron is shaped as shown in Fig. 2 and set over the coil to utilize all the heat and confine the gas flame within the coil. Slip hose connections would answer as well as metal connections, if a close fit is

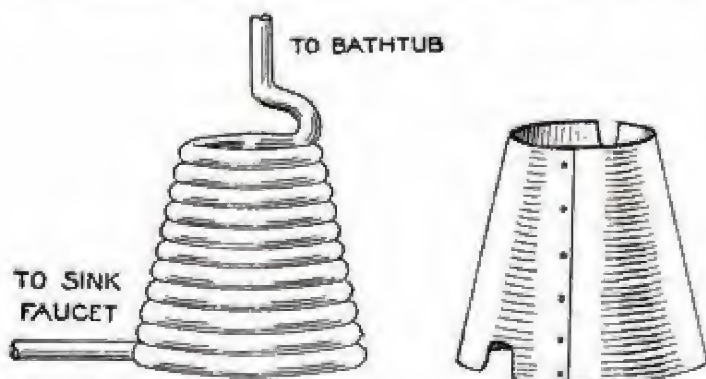


Fig. 1

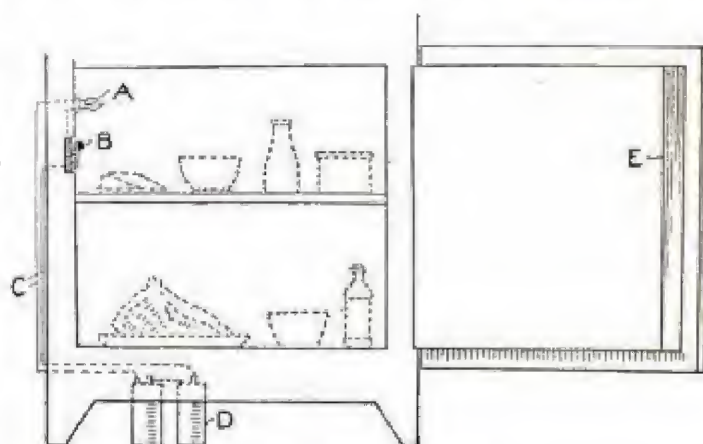
Fig. 2

Copper Coil and Iron Cover

secured. The water should be turned on before lighting the burner. A decreased flow will give hotter water.—Contributed by Victor Labadie, Dallas, Texas.

Lighting Interior of Refrigerator

The place for the refrigerator in my home does not permit enough light to enter when the door is opened to



Location of Lamp

plainly see the articles within. This made it necessary to have a light of some kind, and I rigged up a very practical little device to light the interior when the door is opened. The lamp is a miniature, flashlight-type globe set in a miniature socket, fastened with screws on the wall inside of the refrigerator, where it will not be in the way.

The switch is an ordinary one-pole type, which is fastened to the refrigerator just inside the door with the handle projecting so that it will be pushed open by the shoulder on the door when this is closed. This prevents leaving the lamp burning thoughtlessly. The wires are carried through the wall or floor and connected to a battery of two dry cells beneath the refrigerator.—Contributed by Clarence G. Myers, Waterloo, Iowa.

Ⓒ Filing babbitt is made easy by using a rod having a standard thread, newly cut. This will not fill up like an ordinary file.

Painting the Inside of a Rain Pipe

While painting the rain pipes on a house I thought of a way to paint the inside of the pipes. I procured a sponge large enough to fit the inside of the pipe and fastened a weighted cord to it. I then dropped the weight through the pipe and forced the sponge

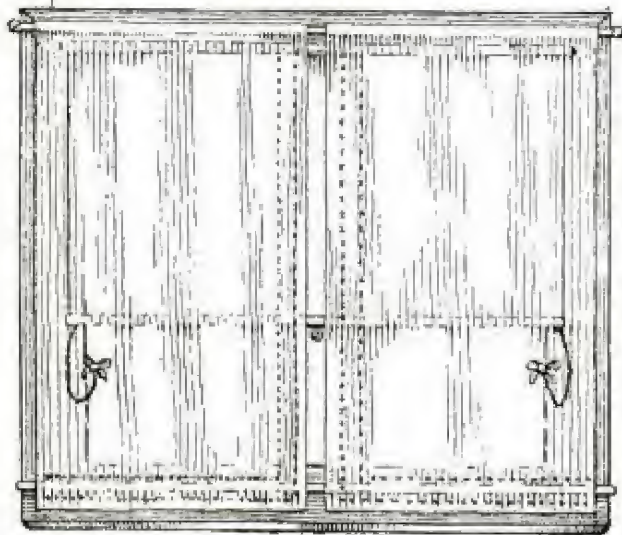


FIG 1

Curtains Tied to the End of the Shade

them in the holes. The cloth is shown at A in the sketch and one of the eyelets at B. The cloth is kept taut by the thumbscrew in the same way as drawing up the hacksaw blade. Strips of emery cloth in the various grades can be prepared and kept ready for use in the frame.—Contributed by Oscar Carlson, Tacoma, Wash.

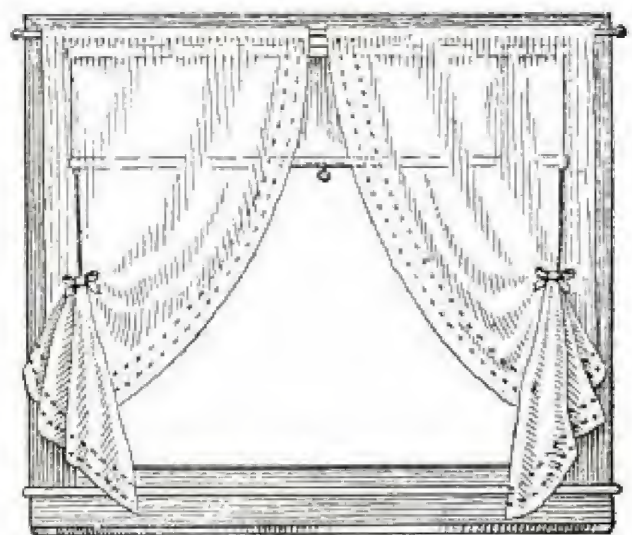


FIG.2

a few inches into the pipe, making a cavity large enough to hold paint. Fill the cavity with paint and pull the sponge by the cord slowly through the pipe. Place an old pail at the bottom to catch the surplus paint. This method will apply a coat of paint to the inside of the pipe that will preserve the metal as well as if painted with a brush.—Contributed by Ed. Borchik, Cleveland, O.

Emery Cloth Used in a Hacksaw Frame

The illustration shows an emery-cloth holder for polishing small places or round edges. It consists of a hack-



Emery Cloth in Frame

saw frame and emery cloth. The cloth is cut $\frac{1}{2}$ in. wide and the length of the saw blade. Punch a hole in the cloth $\frac{1}{2}$ in. from each end. Procure some eyelets from a shoe store and rivet

Lace Curtains Drawn Back with the Shad

An easy and convenient way of drawing back lace curtains is to attach them to the window shade as shown in the sketch. On bright days sufficient light will enter the room for reading when the shade is within 18 in. of being closed as shown in Fig. 1. On dark days, even with the shade to the top of the sash, I find the light insufficient, unless the lace curtains are drawn back, also. I accomplish the whole process by just raising the shade.

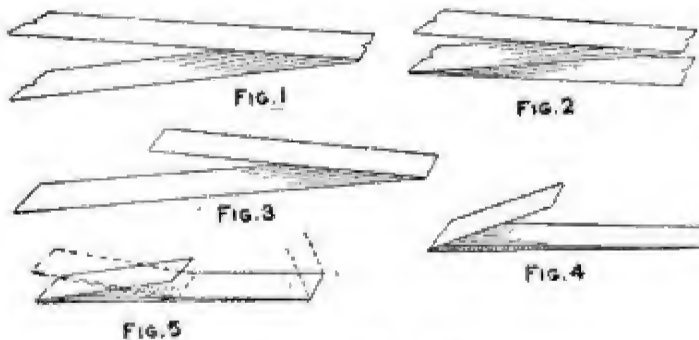
Attach a small screweye to the end of the bottom slat. Connect it with some part of the lace curtain with a cord in such a way that it will allow the shade to be closed entirely, and when raising the shade higher than shown in Fig. 1 it will draw the curtains back as though they were draped, as shown in Fig. 2. A bow of ribbon, artificial flowers or any other suitable ornament, may be placed where the cord is attached to the curtain.—Contributed by M. O. Henning, Swissvale, Pa.

Marking Divisions on Circumferences of Shafts

A method of finding certain equal divisions on the circumferences of shafts, body bands of gas and electric fixtures or on any cylindrical surface where dividers are not at hand or cannot easily be used, is shown in the sketch.

Cut a piece of paper about $\frac{1}{2}$ in. in width, or smaller if necessary, and a little longer than the length of surface to be divided. Put the paper around the cylinder and cut it so that the ends just meet when the paper is pulled snugly to the surface, then fold and cut for the various divisions as follows:

To find the point diametrically opposite, fold as in Fig. 1 and cut notches



Strips of Paper Folded

out at the ends, then place the paper on the cylinder and mark the division in line with the fold or break on the surface through the holes. For three divisions fold the paper as shown in Fig. 2, and for four divisions, fold as shown in Fig. 1 and then double. For five divisions, fold as shown in Fig. 3 by lapping the end over two-thirds the way, then folding the single end back over the double part, Fig. 4, then doubling in the center, Fig. 5. With a little practice one can make these papers quite perfect with almost any number of divisions.—Contributed by G. T. Nelson, St. Paul, Minn.

Curtain Ventilator for a Van

When passing a large van one day I saw it was fitted with a clever curtain ventilator, evidently homemade, that could be raised and lowered at

usual curtain on the back end extended to within 6 or 8 in. of the top. Above this was hung a small independent

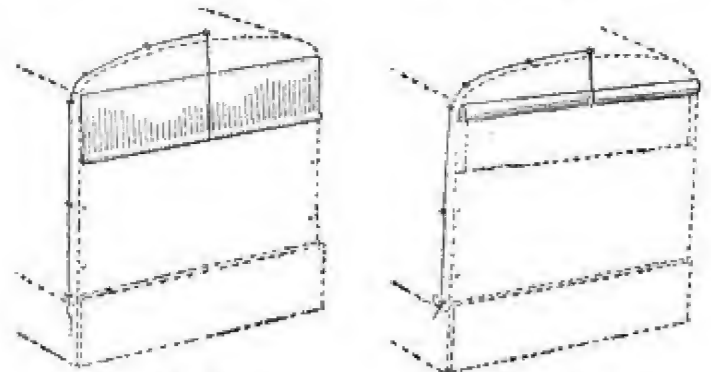


Fig. 1

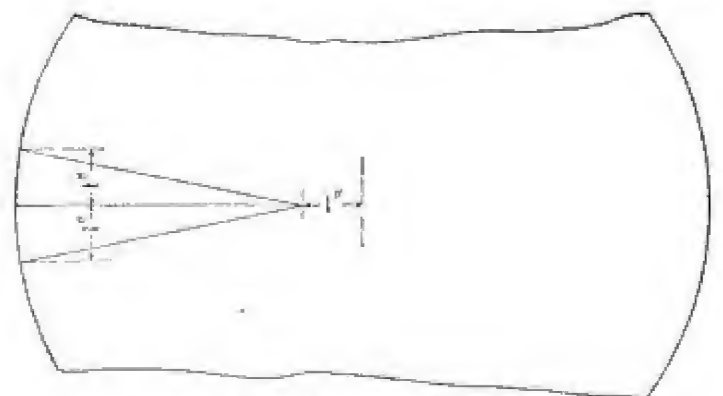
Ventilator on Van

Fig. 2

curtain having an iron rod fitted in the hem so as to cause it to hang without flapping, and also to make it drop when the elevating cord is released. The cord is run through screweyes turned into the side of the van, as shown in Fig. 1. The curtain is shown drawn up in Fig. 2.—Contributed by Jas. M. Kane, Doylestown, Pa.

How to Cut a Cone-Shaped Kettle Cover

Cut the metal 1 in. larger in diameter than the hoop after the edge is turned. Mark a line starting 1 in. from the center and extend it to the edge. Mark two other lines starting from the same point and extending each to a point 1 in. on each side of the center line as shown in the sketch. Cut out the gore and turn the edge tapering from

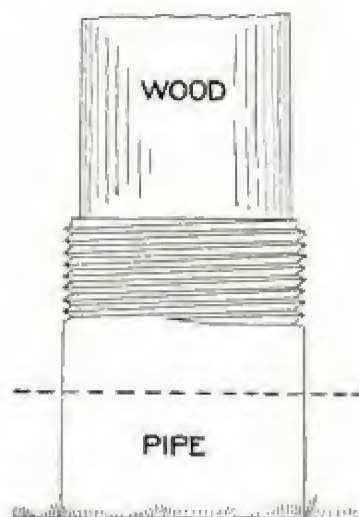


Size of Gore to be Cut

the circumference to the center on a hatchet stake. No edges are to be allowed.—Contributed by S. C. Ship-

Removing Obstruction in a Well Casing

When putting down or driving the ordinary tubular wells it often happens that the pipe must pass through a stratum of soft sticky soil or clay.



The strainer or point on the bottom end of the pipe will become completely sealed up, thereby preventing the entrance of the water into the pipe, which naturally prevents the pump from raising the water.

Ordinarily it is the custom to pull out the pipe and clean the strainer to remedy the trouble, but having had trouble of this kind recently, it occurred to me that the obstruction might be removed without withdrawing the pipe.

When I found that the point was sealed, I procured a round piece of wood that would fit the inside of the pipe snugly, the wood being about 1 ft. in length. The pipe was filled with water to the point shown by the dotted line in the sketch, then the wood plunger was placed on top of the water and struck a sharp blow with a hammer. The obstruction was completely removed. The wood must be held or else the suction of the water will draw it into the pipe.—Contributed by E. S. Sheperd, Wichita, Kans.

Producing Marble Effects with Paint

Prepare the colors to be shown in the marble, using varnish for the vehicle and japan colors, reduced in turpentine, making glaze colors or varnish stains. Put in the ground color with lead and turpentine and allow it to dry, then apply different glaze colors so as

No care need to be taken for this part of the work, as the crudest efforts give the best results.

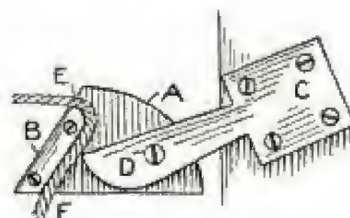
Dissolve a lump of potash the size of a pea in 1 oz. of kerosene, and while the glaze coat is fresh, dash small drops of this on the painted surface. This will separate the colors and blend them into very pretty marble effects.

By the exercise of a little taste and ingenuity surprising effects can be obtained. If spar varnish is used, it can be rubbed down and a coat of clear spar put on as a protector.

I have in my yard a pair of large garden urns made of plaster-of-paris marbled to a malachite green, and these have stood the weather for four years.—Contributed by Wm. G. Browning, Los Angeles, Cal.

Clothesline Holder

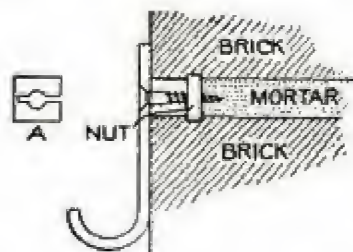
The holder consists of a stationary piece, C, fastened to the post, on which the piece A is pivoted on the screw D, the piece A having a block B fastened to its edge as shown.



The clothesline E is passed over the block B and drawn as taut as necessary, then it is gripped between the block B and the pointed end of C.—Contributed by H. Frisch, St. Louis, Mo.

Substitute for an Expansion Bolt

A very effective, simple and cheap method of fastening anything on brick walls where expansion bolts are not at hand is as follows: Take a common nut, $\frac{3}{8}$ in. square, and cut it almost through with a hacksaw as shown at A.



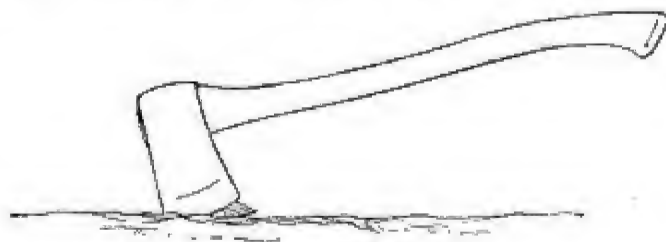
The size of the nut is governed by the

bricks or the size of the hole made in the wall. The size of the hole in the nut should be about the same diameter as the wood screw at a point about $\frac{1}{4}$ in. from the end.

After making a hole in the mortar between the bricks, the prepared nut is inserted and the screw driven into it. The screw will spread the parts of the nut and firmly hold it between the bricks. Be sure to have the cut in the nut parallel with the two bricks between which it is wedged.—Contributed by Gilbert A. Wehr, Baltimore, Maryland.

Removing a Stuck Ax

An easy way to remove an ax stuck in a log is to use the method shown in the sketch. A small chip is placed under the cutting edge of the ax on the handle end and a pressure on the



Ax in the Wood

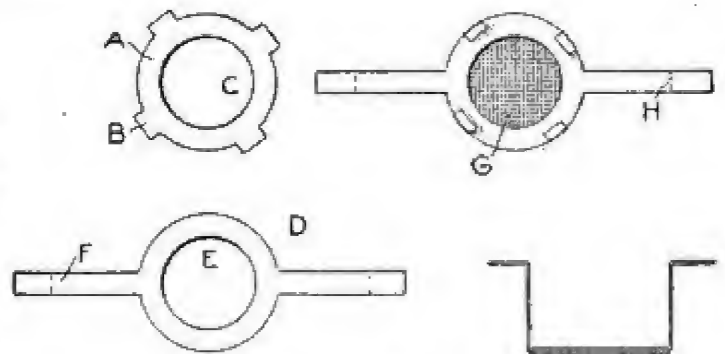
handle will easily withdraw the blade. When the ax is stuck so that the entire edge is in the wood, raise the handle until a part of the edge is out above the surface.—Contributed by Fremont Leland, Chester, Conn.

Sink-Drain Strainer

Bath, sink and other drain pipes clog easily where the opening is left entirely open. A little device can be made at home to keep the drain pipes clean, and its cost will be practically nothing.

The illustration A shows a piece cut from tin having four projections B and an opening C. Another piece is cut as shown at D with projections F and an opening E the same size as the one at C. A small piece of screen is placed over the opening E and the projections B bent over the edge as in G.

shape shown in the last sketch. The diameter of A and D should be a trifle less than the inside diameter of the drain opening.

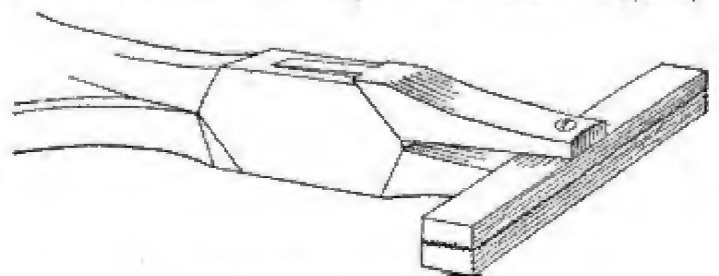


Parts of Strainer

Set the strainer in the opening of the drain and it will keep out all dirt that is apt to stop in the pipe. The wire screen can be easily replaced if it becomes worn.—Contributed by Maurice Baudier, New Orleans, La.

Stretcher for Covers

The ordinary way of stretching a piece of leather, canvas or other like covering is to pull the edges with the fingers. This will make an uneven surface, as the material cannot be drawn very tightly or at every part of the edge. The tool described herewith will be found quite useful for the home or shop. It is made of a pair of long-nosed pliers provided with a pair of notched clamps which are fastened with machine screws. In using the tool the edge of the cover is gripped between the clamps and then tightly



Notched Clamps in Pliers

drawn and held while tacking the cover.—Contributed by Wm. Grotzinger, Baltimore, Md.

Ⓒ Approximately every 2 ft. of elevation is equal to 1 lb. pressure per

Splicing Rope Drives

By W. B. HOSFORD

Many interesting experiments in rope splicing have been made in an effort to obtain a splice that will fill the bill in every particular in connection with the American system of rope driving. A long rope splice that has so far given the best of results is shown in the sketches. These show each successive operation in splicing a $1\frac{1}{2}$ -in. four-strand rope.

After the rope has been tied and unraveled, measure back from the end of the rope the necessary distance, about 7 ft. for $1\frac{1}{2}$ -in. rope, and tie securely with a piece of twine, as shown in Fig. 1. A good rule for all sizes of rope is to measure back 60 diameters of the rope to be spliced and tie it, then unlay the strands of each end back to the twine tie. Cut the core close to the end of the solid rope and place the ends together and join each pair of strands as shown in Fig. 2.

Take one pair of strands and unlay one and lay in the other until the length is in place, allowing sufficient end to do the tucking as shown in Fig. 3. Treat the other pairs in the same manner, so as to leave the three spaces between strands the same distance apart, as shown in Fig. 4. Each pair of strands are unlaid two full turns back from the point of meeting, as shown by the half strands 3 and 4 in Fig. 5. Each strand is now divided equally, one-half of each strand is laid forward to the center of the space between the two dropped half strands and tied in a simple knot, so as to have the threads running in the same direction as they are running in the rope. These are shown at A in Fig. 6, after the tie is made. The rope is now held and opened with a marlin spike as shown in Fig. 8.

Take strand 3 (Fig. 7) and lay it around until it meets half strand 4. Untwist the threads in the loop as shown and draw them in until the threads run in the same direction as

peat the same operation in the opposite direction using half strand 4 to meet half strand 3. The end is ready to tuck at this point. Treat all strands where they meet, in the same manner.

The operation of tucking is shown in Figs. 8, 9 and 10. Cut half strand 3, Fig. 8, for convenience, and take out one thread, and one thread out of strand 4, or the tucking strand, insert the marlin spike so as to open the strand, holding the rope as shown. Pull the remaining threads of half strand 3 out from under strand, making room for 4. Draw half strand 4 over and under, taking the twist out of the threads, as shown in Fig. 9, pull down firmly in the direction the strands run in the main body of the rope. Continue to repeat this operation, dropping a thread out of each half strand until all the threads are dropped. Treat all strands alike and the rope will have the appearance shown in Fig. 10. Cut the threads off close to the body of the rope and it will have the appearance shown in Fig. 11.

In splicing a three-strand rope, the operation of measuring back, tying, unraveling and butting together is the same as in a four-strand rope. There is one pair of strands less and one pair of strands is laid out in each direction, leaving a tucking end and one pair of strands remain in the center. Every other operation is the same as for a four-strand rope.

Grinding a Twist Drill

When drilling, either grind the cutting edge of the drill to the center of the supporting rib, or first use another drill which is not less in size than the center rib, as on a 1-in. drill there is about $\frac{1}{8}$ in. of stock in the center without any cutting edge. If the cutting edge is not carried to the center of the rib or no small drill used in advance, there is a great waste of power and



FIG. 1



FIG. 2

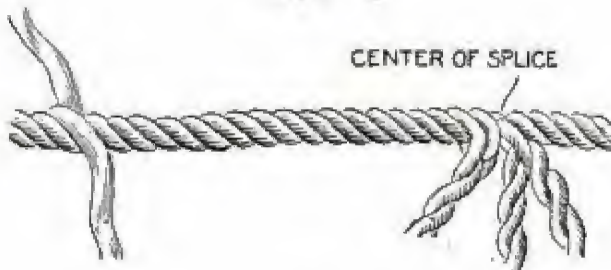


FIG. 3



FIG. 4

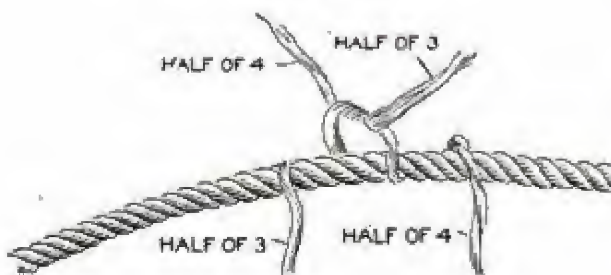


FIG. 5

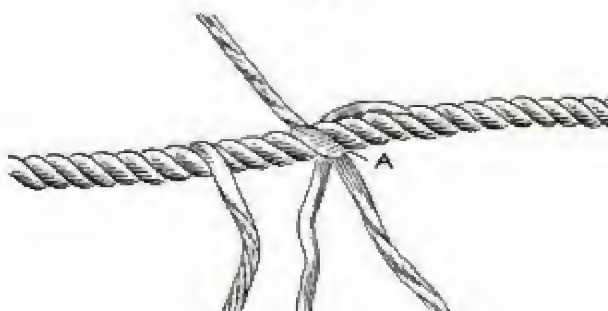


FIG. 6

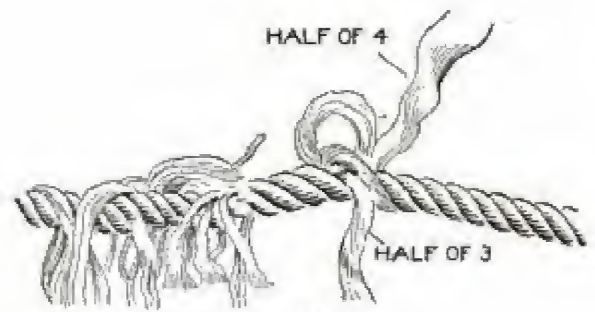


FIG. 7

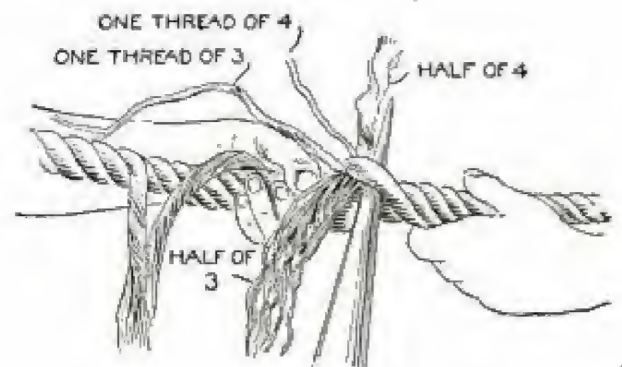


FIG. 8



FIG. 9



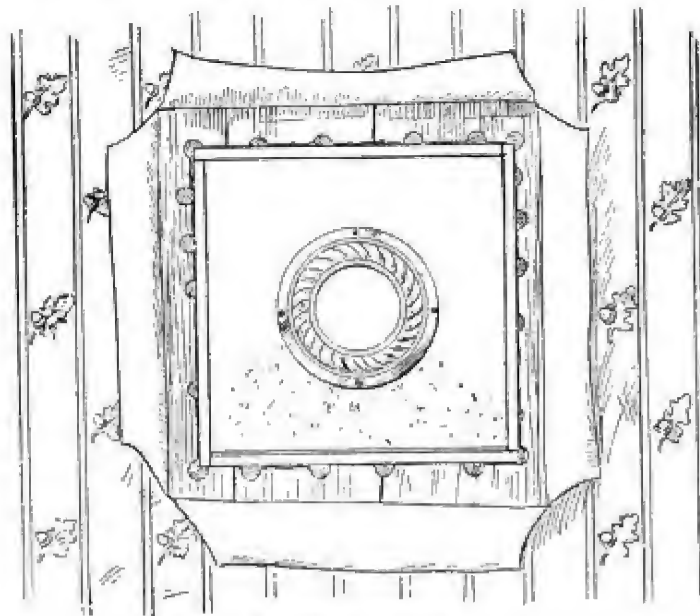
FIG. 10



FIG. 11

Protecting a Wood Partition Around a Stovepipe

The sketch shows a very satisfactory method of protecting a thin board partition through which a stovepipe is passed. A square, 14 in. each way, is



Asbestos Filling

marked on the wall where the pipe is to pass through and the wallpaper cut with a sharp knife in such a way that it will turn back and expose the boards. Bore sufficient holes on the lines of the square to enable one to cut it out with a keyhole saw or ordinary handsaw.

Place a piece of asbestos board that is about $\frac{1}{8}$ in. thick in the space where the boards were removed. The asbestos can be obtained at any hardware store. Fasten the board on all sides with eight small pine strips, each about $\frac{3}{8}$ in. thick and of a length to make a neat double frame which can be held secure by a few nails or screws. Turn the wallpaper back and paste in place, or put on new paper around the frame, if the old paper has been damaged. Cut a round hole, a little larger than the stovepipe, in the asbestos before fastening it in the partition.

Procure a couple of tin stovepipe collars and lay them down together evenly and punch four or more small holes in their rims. Fasten the collars, one on each side of the asbestos board, over the hole with roundhead stove bolts. The stovepipe joint is run

through the collars. This will make an arrangement that will be a safe one, and, if well done, a neat appearing job in a situation where it would be impossible to use a chimney ring.—Contributed by J. G. Allshouse, Avonmore, Pa.

Pressure-Gauge Tester

Every engineer, stationary or marine, can easily make the pressure-gauge tester shown in the sketch. The cost for the material will be small, and, although not so elaborate as the factory-made article, it will give first-class results.

The main body A is a piece of brass tubing, 12 in. long and $1\frac{1}{2}$ in. in diameter. Two holes are drilled on one side, one at each end, and fitted with two $\frac{1}{4}$ -in. pipe couplings, DD, which are soldered in place. Another brass tube B, 12 in. long and 1 in. in diameter, having a hole in it at C, is fastened with the tube A on a solid disk, I. A $1\frac{1}{2}$ -in. washer, F, with a hole the same size as the inside tube is soldered on the other end of the tubes. The hole in the washer is threaded to receive the bushing G, which has a bolt with a long thread to fit its internal threads. An iron washer and a good cup leather is attached to the end of the rod at E.

Fill the tubes with water and place a test gauge on one of the openings D and a gauge to be tested on the

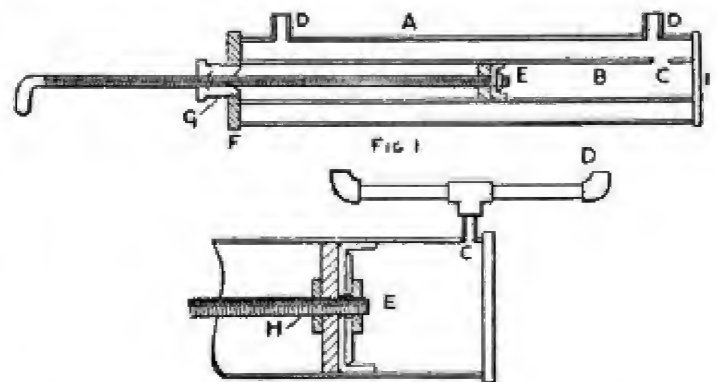


Fig. 2
Details of the Tester

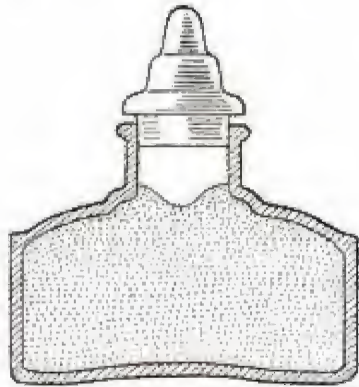
other opening D. Before filling with water, the piston E should be at the washer end F. Turn the rod to make a pressure on the water. The number

of pounds pressure can be raised as desired.

In Fig. 2 is shown a single tube tester which is very simple. Its construction can be understood by the sketch. As high as 300 lb. pressure can be obtained with a few turns of the rod.—Contributed by Jas. E. Noble, Toronto, Can.

Ink Well for a Lettering Pen

The sketch shows an ordinary drawing-ink bottle filled with cement up to the neck, leaving a very small space at the top for ink. The advantage of

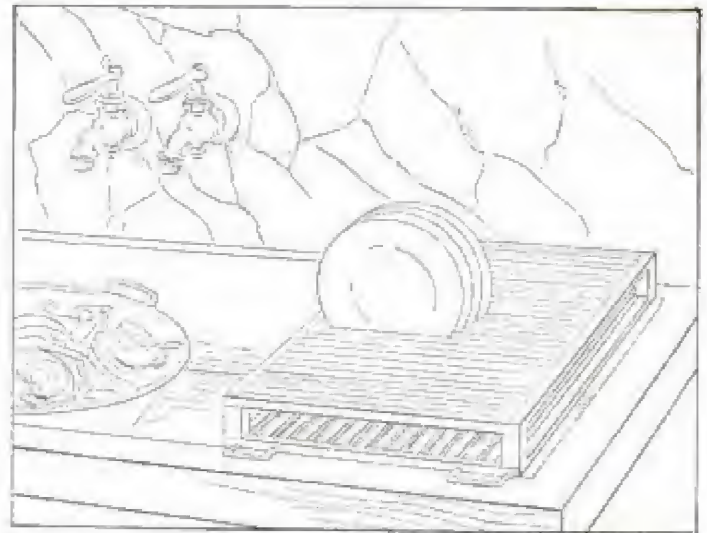


this well, which is for use with the lettering pen, is that the pen need be only dipped in the ink a short distance, avoiding the smearing of ink on the pen holder, as is usually the case. The ce-

ment filling makes a heavy paper weight of the bottle, which will not easily tip over. The stopper should be cut as short as practicable so that it will not limit the ink space. While the capacity is small, it is sufficient for ordinary work, as the lettering does not require much ink.—Contributed by J. J. O'Brien, Buffalo, N. Y.

Drain Board for a Sink

The simple drain board shown in the sketch is a great kitchen help. It consists of two frames of pine strips each 1 ft. wide and just long enough to fit across the sink. Nail the cross strips far enough apart to allow a plate to stand upright. Reverse the frames so that the strips in one frame will be at right angles to those in the other. Make four uprights about 2 in. high to support the corners and keep the two frames apart. In washing dishes place them on this drainer and pour

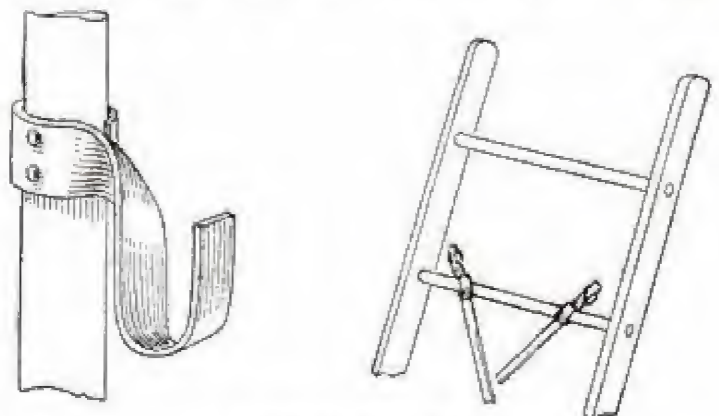


Plates between Slats

drying is necessary. The end of the board nearest the wall may be hinged and when not in use it is hooked up out of the way.

Ladder Props

It is often necessary for the owner of a house or garden to do some work that requires a ladder. Most ladders are heavy and hard to handle. The illustration shows a light ladder that can be placed anywhere alone or against uneven surfaces. The two props, which extend to the ground, are detachable and can be set up at any angle. The hooks are easily made by any blacksmith and riveted to the poles. They are set under any rung and, when climbing the ladder, it will stay where it is placed. The climber need not fear falling headlong, even though he may stand on the top rung. When

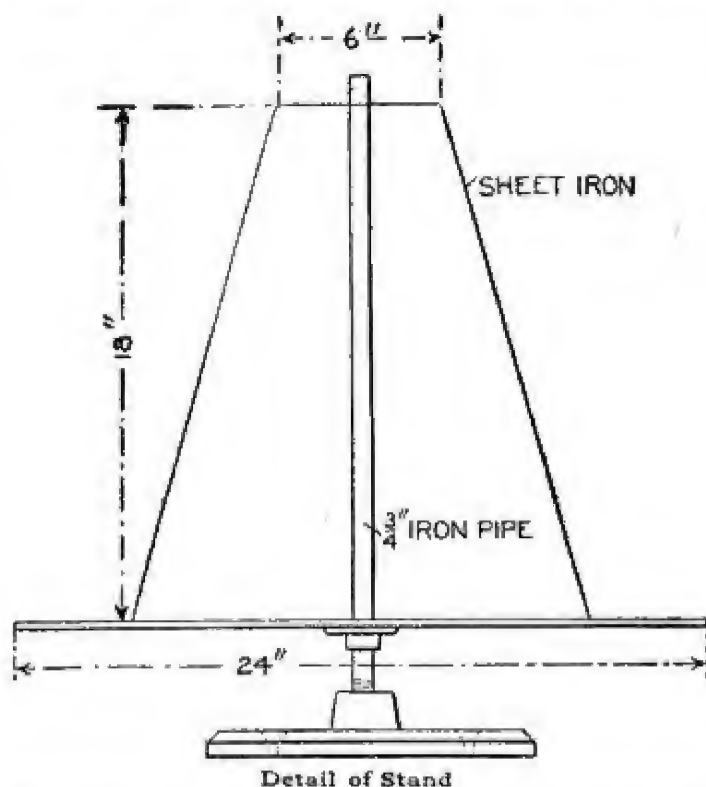


Props on the Ladder

gathering fruit, this ladder can be set against any limb without danger of breaking the branches.—Contributed

Stand for Holding Coiled Wire

A stand for holding coiled wire in various sizes is shown in the sketch. The stand is suitable for the shop or



salesroom. Such a stand will hold a coil of wire and keep it from becoming tangled as the wire is used or sold.—Contributed by Peter J. Theisen, Denver, Colo.

How to Prevent Motorcycle Belts from Slipping

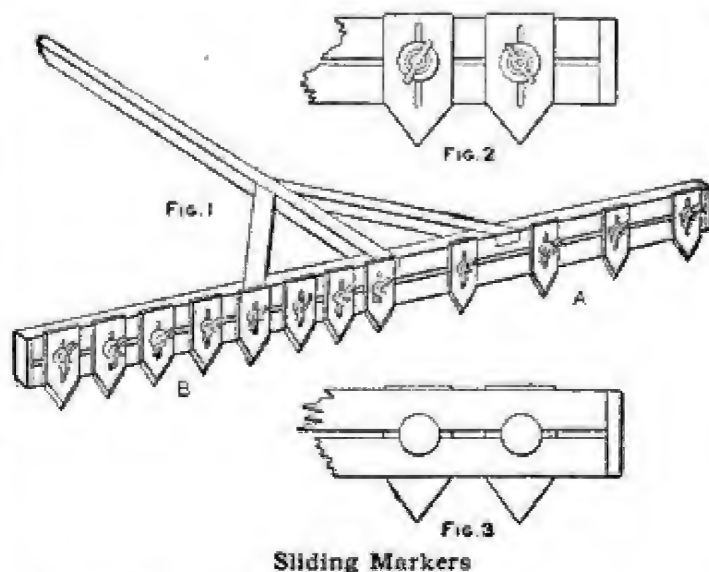
Having had considerable trouble with flat belts slipping on motorcycle engine pulleys owing to dust and dry surfaces, and after trying various kinds of dressing and building up the metal surface with friction tape, leather, rubber, etc., to increase the friction, I used the following method with better results: A strip of canvas was cut to fit in between the flanges of the driving pulley, thoroughly soaked in good glue, and wound tightly on the pulley surface until it consisted of six layers. After this dried, it gave excellent results. The band wears well and increases the friction between the surfaces, and it also allows the driving belt to run with less tension.—Contributed by Geo. Forest, Crystal Lake,

Test of Humidity in Living Rooms

The French Journal de la Sant (Sanitation or Health Journal) gives the following simple test for determining whether or not the humidity of a building unfits it for habitation. Place a known quantity, say 2 or 3 lb., of newly slaked lime in the suspected apartment, closing the doors and windows hermetically as in disinfecting it, and after 24 hours weigh the lime again. If it has increased in weight one per cent or more, the apartment should be pronounced insanitary.

An Adjustable Garden Marker

The adjustable marker is made on the same principle as the ordinary garden rake or marker with the exception of the teeth, which can be set at any distance apart (Fig. 1). The part holding the teeth consists of two strips of wood, 3 ft. long, 1½ in. wide, and 5⁄8 in. thick, fastened at the ends so that they will have a space between them for bolts. The teeth or markers are fastened with 3⁄8-in. bolts having washers and thumbnuts. These are shown in Fig. 2. The opposite side of the strips with the bolt heads is shown in Fig. 3. The teeth can be set from ¼ in. to 3 ft. apart. The teeth are shown set 4½ in. apart at A and 2¼



in. at B. The markers not in use can be raised up so the points will be on a level with the lower edges of the bottom strip.—Contributed by E. R.

Lathe Parallels

For boring, facing and special lathe work, a pair of parallels such as shown in the sketch is quite useful. Reference to the sketch shows that the parallels are provided at each end with a foot through which bolts are passed to secure them to the lathe carriage. A T-slot is cut in the top to provide a way for clamping the work to the parallels quickly and securely. If both parallel castings are planed up alike, work set on them which must be bored parallel to a given face is directly in line with the cut of a lathe.

When a large number of pieces of the same kind are to be machined, it will pay to make a special plate to fit them and bolt it to the lathe parallels. Cylinders, bearings and work too large to

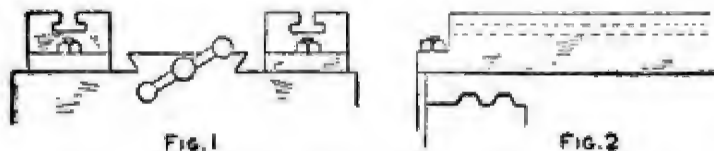


FIG. 1

FIG. 2

Parallels on Lathe Carriage

swing on a faceplate may be bored and faced with this aid.—Contributed by Donald A. Hampson, Middletown, New York.

Keeping Vermin out of Beehives

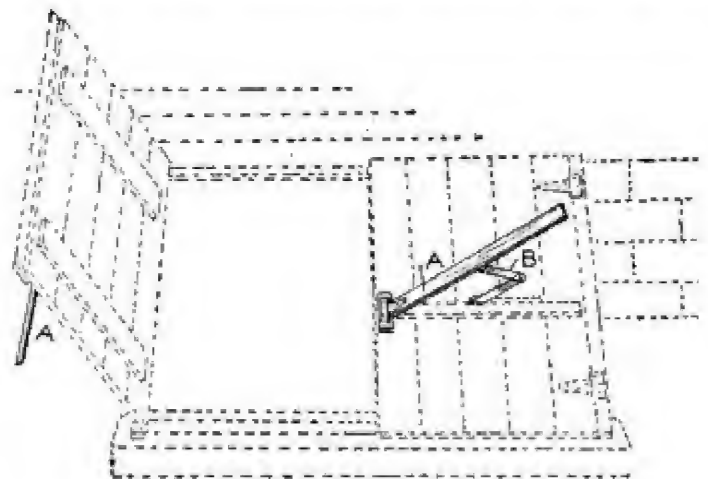
Mice and ants can be kept from entering beehives by setting the hives on the bottoms of inverted quart bottles whose necks are set in the ground. Be sure to keep the grass or weeds cut close to the ground about each hive.—Contributed by Paul Woodward, Rodney, Iowa.

Cellar-Door Support

The illustration shows a self-opening and self-closing support for a cellar door. One-half of the door is shown opened and resting on the support A. The other one-half shows the support fastened in place. It is very simple to make and attach.

Use a strip of wood for the support, $\frac{7}{8}$ by 2 in., with the required length

wanted when open. Fasten two blocks with screws, one on each door as shown, and attach a support to each

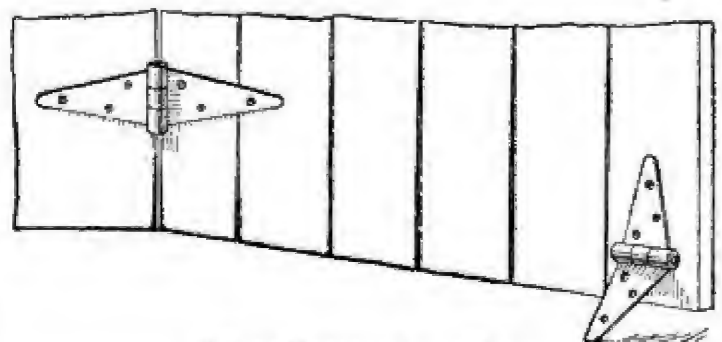


Folding Support

block with a tee hinge. The folding bracket B is easily made of a piece of hoop iron. The support will lay flat on the door when it is closed but will open up to the right position for a support as soon as the door is opened.—Contributed by W. A. Proctor, Clef-tondale, Mass.

Hinge Stop on a Gate

An ordinary gate or barndoor can be kept partly open or held in any position against a wind or draft by the use of a stop as shown in the sketch. The stop is made from an ordinary hinge which has only one wing fastened to the lower part of the door or gate. The loose wing catches on the floor, ground



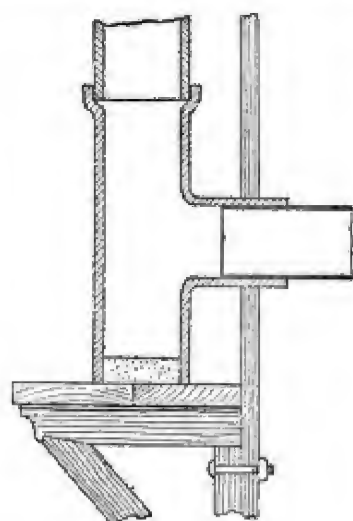
Hinge Fastened to a Gate

or cement walk. When not in use it is turned up against the gate.—Contributed by W. E. Cleveland, Chicago.

After cutting a taper on a lathe, do

Fireproof Chimney for Frame Houses

In a mining camp where many fires were caused by defective chimneys the one described herewith was adopted as



the best and safest kind for a frame house. It finally became compulsory to have every frame house equipped with this chimney. This style of chimney is inexpensive and the parts can be purchased in almost any

little country place.

A bracket is made and fastened to the outside of the wall on which a tee joint of terra-cotta sewer pipe is set and a bottom of cement put in on the boards. The tee opening extends through the wall and is used for the stovepipe opening. The chimney is then built up as high as desired with sewer pipe, the joints being well cemented.—Contributed by W. A. Lane, El Paso, Texas.

Testing Lubricating Oils

Place one drop of each oil to be tested on a piece of glass so that the drops will be in a line at one end. The glass should be about 30 in. long with a width sufficient to hold the number of drops without their mixing. Raise the end on which the drops were placed, about 6 or 8 in., to form an inclined plane. The oil will run down this plane. An oil having a light body runs and dries quickly, but an oil that has both a body and a free flow will be readily detected by this test. An oil may have a good body and yet may have a tendency to gum badly, which quality will also be detected on the glass. The oils should be protected from dust while these tests are being made.

Furniture Polish

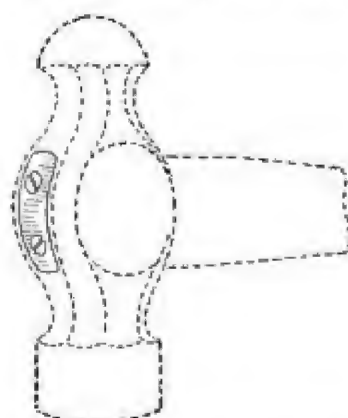
The following formula makes an excellent creamy furniture polish:

Animal oil soap.....	1 oz.
Solution of potassium hydroxide.....	5 oz.
Beeswax	1 lb.
Oil of turpentine	3 pt.
Water enough to make.....	5 pt.

Dissolve the soap in the lye with the aid of heat; add this solution all at once to the warm solution of wax in the oil, says the Druggists' Circular. Beat the mixture until a smooth cream is formed, and gradually beat in the water until the whole is completely emulsified.

Fastening Hammer Handles

The illustration shows a method used by a correspondent of American Black-



smith to keep hammers from coming loose on handles. The hammer is first set on the handle and then it is wedged as tightly as possible. Two $\frac{1}{16}$ -in. holes are drilled in the end of the wood and two large wood screws driven into the holes. The screws never come out and the hammer head does not come loose.

Electric Welding of Metal Saws

The installation of a cold-metal saw in a factory called for an operator, and the man selected was unskilled in the use of the machine. The saws used were $\frac{1}{4}$ in. thick and 3 ft. in diameter. Three of the saws were broken by the workman. One of the saws had a crack $4\frac{1}{2}$ in. in length from the cir-



cumference. This was placed on an electric welding machine and a piece about the size of a silver quarter broken from a $\frac{1}{16}$ -in. thick metal saw placed on each side of the crack. These welds were made about 1 in. apart. The current was used on the fourth power. The surplus metal was chipped off and the surface ground.

Another saw had six cracks all running toward the center from the outside. They were all treated in the same manner. This method was used after an unsuccessful attempt to join the break by brazing.—Contributed by John B. Roberts, Pittsburg, Pa.

Adjustable Mirror

A flat piece of iron, A, Fig. 1, 6 ft. long, $\frac{1}{2}$ in. thick and 1 in. wide, is attached to the wall or window casing with a screw. The mirror B is attached



FIG. 1

FIG. 2

Mirror Slides on Bar

to the iron bar by a clasp on the back as shown in Fig. 2. The object of such a device is to adjust the mirror to accommodate different heights. This device will be found quite convenient where there are small children.—Contributed by Milton O. Freeman, Ghent, O.

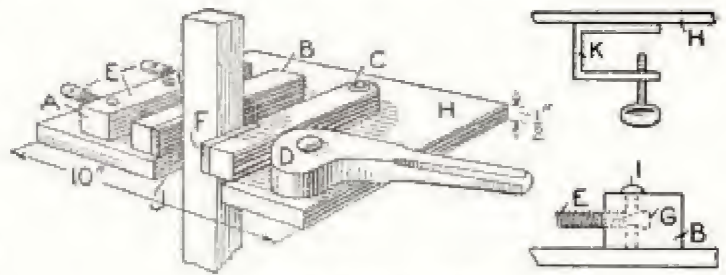
Cementing Brass to Glass

An elastic cement for holding brass to glass can be made by mixing together with a gentle heat 5 oz. of rosin and 1 oz. of beeswax, then stirring in 1 oz. of dry Venetian red slowly, after which take from the fire and let cool. This is used as a cement.

Stains on gold and silver can be removed by immersing in a solution of cyanide of potassium, $\frac{1}{2}$ oz., rain water, 1 pt., and brushing off with prepared chalk.

Vise for a Drill Press

When a number of bars of a uniform size are to be drilled, the vise shown in the sketch is a great time saver, as

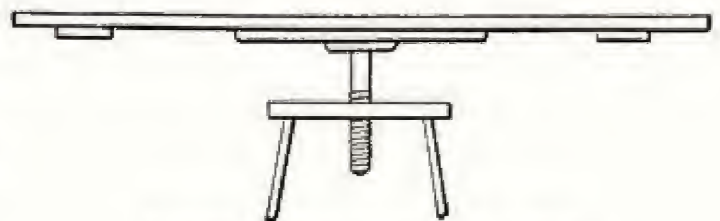


Quick Acting Vise

one movement of the lever D tightens or releases instantly after setting the jaws B and C to the right size by the screws E which turn in the piece A. The pieces A, B and C should be 8 in. long and $1\frac{1}{2}$ in. square. The pieces B and C are fitted with steel jaws F. The piece A is riveted to the base plate H. The ends of the screws E have grooves turned in them to admit a part of the rivet I so that the jaw B may be moved either way with the screw. The clamp K is attached to H so that the whole device can be quickly fastened to the drill table.—Contributed by J. W. Vener, Boston, Mass.

Revolving Drawing Board

In lettering certain kinds of work on an ordinary drawing board the draftsman must move around the board to do credit to his work. He either walks around the board or moves it to get at the work. If the drawing board is attached to a revolving stool, as shown in the sketch, the board can be turned

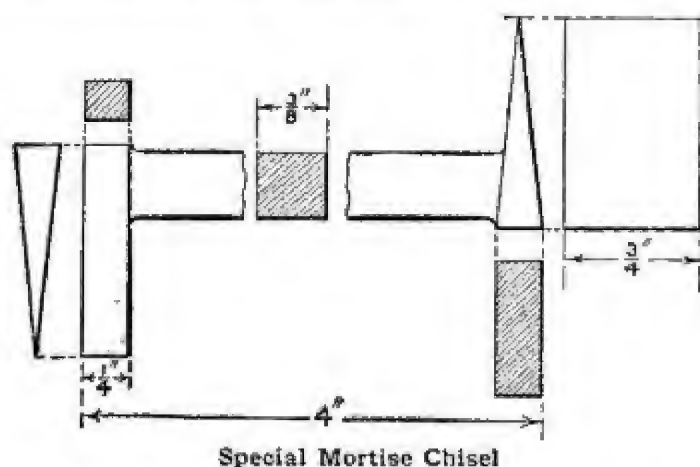


Drawing Board on Revolving Stool

to any angle desired, and also elevated or lowered to a convenient height.—Contributed by F. E. Robertson, College Station, Texas.

Chisel for Cutting Mortises in Cabinet Drawers

When fitting locks in drawers on cabinet work, it is necessary to cut a mortise in the rail above the drawer



end to receive the bolt of the lock. If the drawer is not a very deep one, the work becomes difficult, as the space between the rails is too small to work an ordinary wood chisel. The sketch shows the dimensions and shape of a tool that will do the work. It is made of tool steel and sharpened like a chisel.—Contributed by F. O. Andersen, San Francisco, Cal.

Making Brass Letters in Steel

The letters, name or numbers are cut in the steel surface with acid or steel letter punches and the indentation filled with brass. This is accomplished by heating the prepared steel red-hot in a brazing furnace, forge or kitchen range, and flowing spelter in the indentations. Use borax as a flux and a piece of brass wire for the spelter. The wire can be handled much easier than the regular brazing spelter. Be sure to braze a good thick coat of brass on the lettered surface. After cooling, the surplus brass is filed away from the top of the article and the steel surface polished. The indentations will be filled with brass.

Tools may be marked in this manner. If used for paper weights, the steel surfaces must be lacquered after polishing to keep them from tarnishing.—Contributed by D. O. C. Kersten, Detroit, Mich.

Automobile Cooling Alcohol Mixtures Kept at Proper Strength

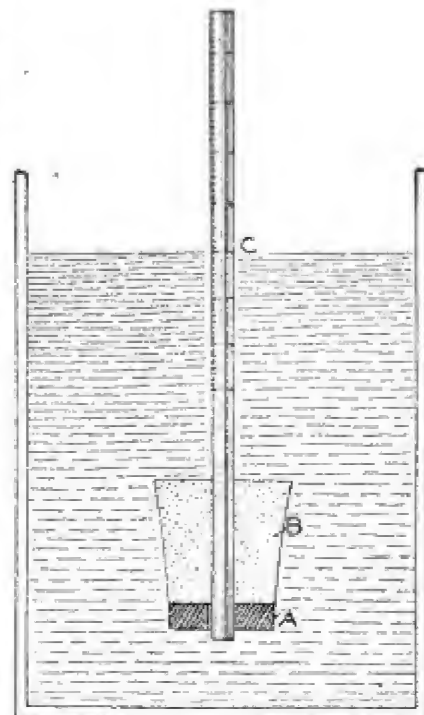
According to law, denatured alcohol is the "grain alcohol of commerce rendered unfit for beverages." The freezing point of this alcohol is about 160 deg. F., says the Automobile. When added to water in various proportions, it lowers the freezing point of the water. An approximation of the freezing points of various proportions of water and denatured alcohol is given in the following table:

Proportion of water in gallons	Proportion of denatured alcohol in quarts	Freezing point in deg. Fahr.
1	1	10
1	1.5	5
1	2.5	-20
1	4	-35

In order to maintain the solution at proper strength, it may be necessary from time to time to add one or other of the constituents to keep the proper proportions. If it is safe to employ a mixture holding 2.5 quarts of denatured alcohol to the gallon of water, it is advisable to maintain this proportion.

A very simple way of observing the relation of alcohol to water is to mix, say, 2½ qt. of denatured alcohol with one gallon of

water and then by means of a weighted float with a stem on it find out how low the float sinks in the solution and mark this point on the stem as shown at C. With a good-sized cork, B, a long slender stick of wood and

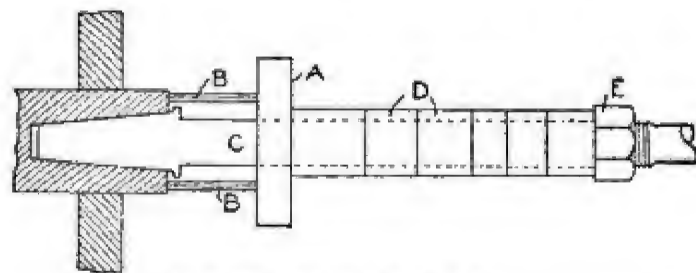


a washer, A, it would be possible to make a measuring instrument in five minutes that will serve every purpose. Calibrate the instrument by finding

out how low it will sink into the solution, and mark the place. After this, all that has to be done is to draw off some of the solution from the radiator in a bucket and drop the instrument into the liquid, noting how low it will sink. If it does not sink down to the mark, add alcohol until it will; if it sinks below the mark, add water to float it up to the same.

Removing a Milling-Machine Arbor

The arbor of a small milling machine had become so firmly lodged in the taper hole that it was impossible to drive out with a hammer from the back, so I had to use some other method to loosen the shank. I stripped the arbor of all its bushings and put on a cutter,



Drawing Arbor with a Nut

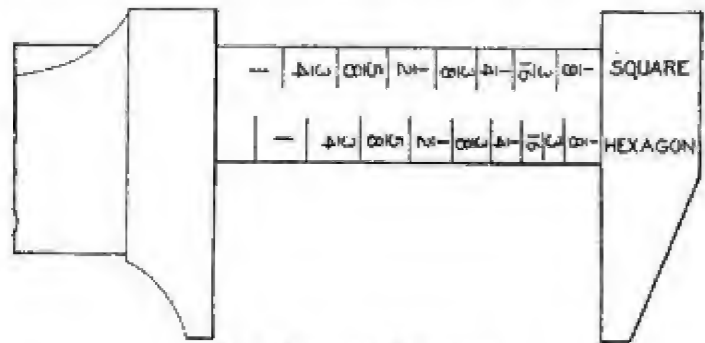
A, then placed two pieces of steel, B, of equal length, between the cutter and the end of the spindle, one on each side of the arbor C. The pieces of steel were long enough to hold the cutter some distance from the shoulder of the arbor. The arbor was filled to the end with bushings, D, and the nut, E, screwed on them. The pressure removed the arbor with ease. Be careful to use a cutter heavy enough to stand the pressure.—Contributed by C. H. Rauschenberg, Greenville, Pa.

How to Bend Tubing or Pipe

Heat the piece where the bend is to be made to a good red heat, then put it in a vise or other convenient place and bend while a stream of water is turned on the inside of the bend. Pipe can be bent in almost any angle in this manner without kinking or breaking.—Contributed by Irl R. Hicks, Hallsville, Mo.

Scale on a Monkey Wrench

A scale stamped on the side of a wrench provides a means for setting the jaws so they will slip on a square

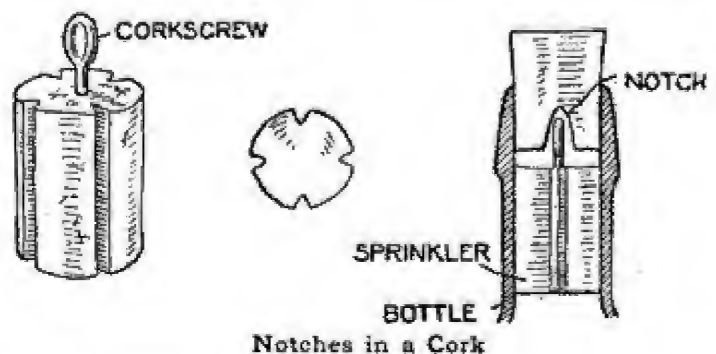


Nut Sizes on Wrench

or hexagon nut without fitting it to the facets. This makes it quite handy for turning nuts in dark and unhandy places. The scale may be marked after setting the jaws on standard square and hexagon nuts of the different sizes. The fractions designate the size of the bolt in fractional parts of an inch.—Contributed by Cecil Richards, Wheeling, W. Va.

A Sprinkler Bottle Stopper

A sprinkling stopper to fit any size bottle can be made by cutting four long notches in a cork as shown in the sketch. Force this notched cork well down in the neck of the bottle after first turning in a small corkscrew so that it can be easily withdrawn when the bottle is to be refilled. Cut a notch



Notches in a Cork

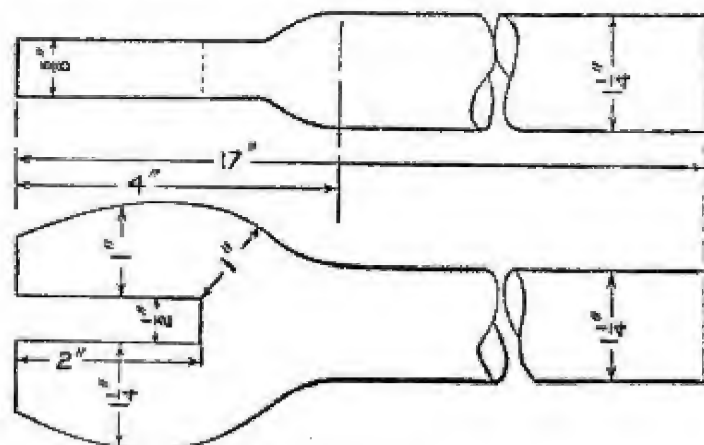
in another cork so as to allow it to fit over the corkscrew. This last cork is to close the bottle when it is not in use.

Do not flood the bearings of a magnet with oil, a few drops once a month is sufficient.

A Pipe-Ripping Tool

The sketch herewith illustrates a very handy tool for ripping wrought-iron pipe. It can be made by any blacksmith at very little cost.

This tool was originally intended for

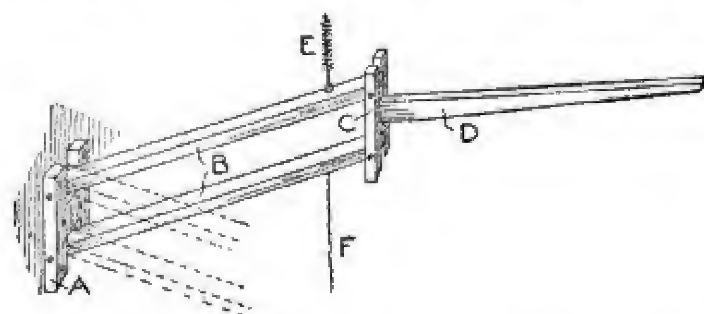


Details of Ripping Tool

breaking 3-in. wrought-iron pipe which contained a cable. The old method of removing the cable was to saw a piece off the side of the pipe and slip the cable out. The ripping tool is held against the open end of the pipe, which enters the opening in the jaws freely. A hard pull upward on the handle will tear a large piece free. One man can rip more pipe in a half hour with this simple tool than he could saw in a day. Such a tool is also of value to plumbers, steam fitters and electricians.—Contributed by G. M. Peterson, Buffalo, New York.

Overhead Clothes Rack

The accompanying illustration shows an overhead rack that is designed to lift up out of the way articles placed



Rack above One's Head

upon it to dry, thus economizing room and using wasted space. The rack can be placed over the range in a kitchen

to receive the tea towels and dishcloths and as they are directly above the heat that rises from the stove, they will dry in a few minutes.

The base A is 1 in. thick, 3 in. wide and 8 in. long, mortised $1\frac{1}{2}$ in. deep by $\frac{3}{16}$ in. wide on each end. The piece C is $1\frac{1}{2}$ in. thick, 2 in. wide and 8 in. long, mortised in the same manner as the base, with the addition of a central mortise, 3 in. long, $\frac{1}{2}$ in. wide and $1\frac{1}{2}$ in. deep, to accommodate the end piece D. The two pieces B are $\frac{1}{2}$ in. thick, 1 in. wide and 30 in. long with a $\frac{3}{16}$ -in. hole bored 1 in. from each end. The piece D is $\frac{1}{2}$ in. thick by 3 in. wide at one end and $1\frac{1}{2}$ in. at the other, and 36 in. long.

To assemble and hang this rack, first screw the base to the wall at the desired place and about $6\frac{1}{2}$ or 7 ft. from the floor. Fasten the pieces B into the mortises in A with a $\frac{3}{16}$ -in. by $3\frac{1}{4}$ -in. bolt in each. Insert the piece D into the central mortise of the piece C and nail on each side and back with small nails. Fasten the loose ends of the pieces B into the mortises in C with $\frac{3}{16}$ -in. by $1\frac{3}{4}$ -in. bolts and fasten a screweye in each of the pieces B, as shown in the sketch. One end of a spring taken from an old shade roller is attached to the upper screweye and the other end is fastened to a screweye turned into the ceiling, after first drawing the spring up with sufficient tension to hold the rack at the desired place. A cord is attached to the lower screweye so that the rack may be pulled down to place the clothes on it for drying.

If it is desired to hang the rack over the center of a stove or table, simply hinge the piece A to the wall with a small pair of butts, then as the rack is pulled down it can be swung around to the side of the stove or table and brought within easy reach.—Contributed by H. J. Tinsley, Lancaster, Ky.

Automobile tires should be inspected after every long run and the cuts attended to immediately.

Fumigating School Books

Many times children are found in school who are suffering from some contagious disease and who are not sick enough to stay at home. They are a source of danger as well as the books and other articles which have been used by them. I devised a way to fumigate these articles whereby they can be disinfected at once and at very little cost.

The device consists of a can—an empty carbide can is very good for this purpose—with a screw top and a place for a candle in the bottom. A carbide can is about $2\frac{1}{2}$ ft. high and 15 in. in diameter. The top of one of these cans can be screwed down tightly to keep in the gas. Formaldehyde candles are used for fumigating. The candles are set in a small tin about $1\frac{1}{2}$ in. in diameter and $\frac{1}{2}$ in. in height. These can be obtained at a slight cost and each one is sufficient to fumigate 1,000 cu. ft.

A hole is cut in the bottom of the large can so that it will admit the upper part of the candle. The books are then placed in the can, which is raised off the floor enough to permit the lower part of the candle to touch the bottom of the fumigator. The top of the can is not put on until the gas begins to issue forth and it is then screwed down firmly. The candle is allowed to burn about one minute, or until the can is well filled with gas. The gas is allowed to act on the books and other articles for about 7 hours. This insures perfect and complete fumigation. The odor of formaldehyde is sometimes unpleasant, but this can be overcome by sprinkling household ammonia over the articles after they are removed.—Contributed by George Thomas Palmer, M. D., Springfield, Ill.

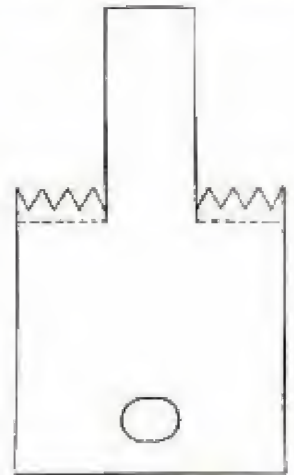
☞ A thick, soft painter's brush is better than waste for removing dust from an automobile engine.

☞ Calipering the front end of a hole does not show that it is bored straight.

Door Lock for Travelers

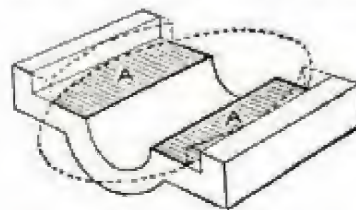
A very simple and effective lock for the inside of doors can be made of two pieces of sheet steel or galvanized iron cut in the shape shown in the sketch.

The teeth are about $\frac{1}{8}$ in. long, and the metal is bent at right angles on the dotted line. The oval hole is made large enough to admit an ordinary lead pencil. The lock is applied by pushing the teeth of one piece into the door casing and the other directly opposite in the door. Close the door and put a pencil or nail through the holes and it will be impossible to open the door from the outside.—Contributed by A. Lester Shipton, Watertown, Mass.



Planer Work in a Lathe

Quite a variety of small machines were made in a shop equipped with a lathe, drill press and grindstone. The lathe, naturally, did most all the work

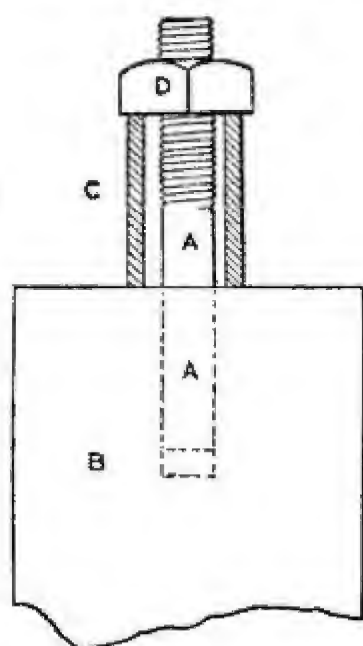


including some planer work. The sketch shows a box having cast edges to guide the cap. These were made in quantities. The portion marked A is the seat for the cap, which had to be machined flat. They were put in a four-jawed chuck in the lathe and faced out as far as the dotted line. This cut out more than three-quarters of the face and a boy chipped out the corners.

Keyways, both internal and external, may be cut by mounting the work and hand-feeding the carriage. Fairly good flat surfaces can be produced by clamping the work to the faceplate and hand-feeding the carriage, using the coarse feed screw each time to take a deeper cut.

Removing a Pin from Cast Iron

My foreman told me more as a joke than otherwise to pull out a 1/2-in. cold-



rolled steel pin, A, which had been driven 1 in. without lubrication into cast iron, B. Thinking I must do it, I tried to turn it with a pipe wrench and only succeeded in roughing the pin in the hole. I then used a method as follows that removed the pin without much work. I cut a thread on the pin with a 1/2-in. die and then put a collar, C, on it and ran a nut, D, on the threads. A hard pull of a 12-in. wrench on the nut removed the pin.—Contributed by Roy E. Coram, No. Chelmsford, Mass.

Coloring Concrete

The latest report of the National Association of Cement Users recommended only certain mineral pigments that should be used for obtaining tinted mortars for concrete or stucco surfaces. These pigments are given in the following list:

Grey	Lampblack, manganese dioxide
Slate	Lampblack, manganese dioxide
Red	Red iron oxide
Bright Red	English red oxide
Brown	Brown roasted iron oxide, brown ocher
Yellow	Ocher
Blue	Ultramarine
Green	Chromium oxide, ultramarine green
Violet	Violet oxide of iron

The amount used should be small, owing to the danger of impairing the strength of the resulting mortar. The limit should be 5 per cent by weight to that of the cement. Even this amount of certain colors which differ little from that of cement, such as yellows and reds, does not produce a

ment. Lampblack is best for darkening, and to lighten the color, use lime. The coloring constituents can be used dry or in a paste, but it is most convenient for mixing to use the dry form, which should be thoroughly mixed with the dry mortar before adding water.

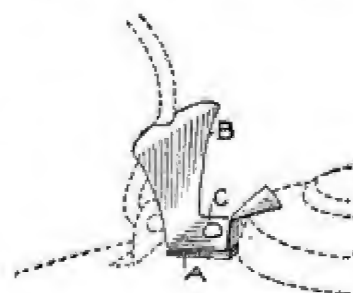
Glass-Cleaning Solution

Glass tumblers, tubing and fancy bottles are hard to clean by washing them in the ordinary way as the parts are hard to reach with the fingers or a brush. The following solution makes an excellent cleaner that will remove dirt and grease from crevices and sharp corners. To 9 parts of water add 1 part of strong sulphuric acid. The acid should be added to the water slowly and not the water to the acid. Add as much bichromate of potash as the solution will dissolve. More bichromate of potash should be added as the precipitate is used in cleaning.

The chemicals can be purchased cheaply from a local drug store, and made up and kept in large bottles. The solution can be used over and over again. If a large jar is filled with the solution, articles of glass can be dipped in it for a few minutes and then washed in clear water.—Contributed by Loren Ward, Des Moines, Iowa.

Kettle Cover Holder

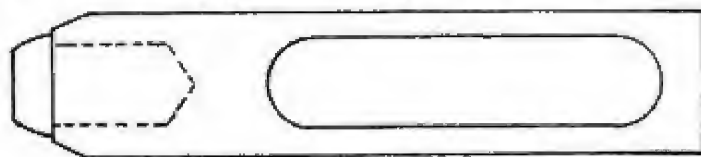
A cover if not hinged to the kettle will fall off when the kettle is tilted for pouring, and this is not only a source of annoyance every time any of the contents of the kettle is poured out, but often results in a bad scald or burned fingers. This annoyance can be prevented by making and attaching to the kettle top the little device shown in the sketch. It is made of



two strips of metal, one soldered to the kettle top and the other riveted to it. When the handle of the kettle is raised it forces the clip over the cover.

Steady-Rest Jaws with Babbitt Ends

In using the steady rest on lathe work, I have always had a lot of trouble with the jaws cutting into and marring the work, especially brass work, says a correspondent of American Machinist. I tried fiber, rawhide and other materials with little or no success, as they all wear away in a very short time; so,



Babbitt in End of Jaw

finally, I tried drilling out the ends of the jaws and filling the hole with babbitt, as shown in the sketch. This method works to perfection.

Spark Gap for Testing

An adjustable spark gap to be used in testing and timing automobile engines can be made as follows: Take a piece of fiber, $\frac{1}{8}$ in. thick, $\frac{1}{2}$ in. wide and $1\frac{3}{4}$ in. long. Bore a $\frac{3}{16}$ -in. hole near each end and fit with a bolt or connection taken from an old dry cell. Put the nuts on a piece of 18-gauge copper wire, about 1 in. long, and fasten them down. Attach a large ter-



Adjustable Spark Gap

minal on one end to slip on the spark plug, and fasten cable to the other end. The spark gap is adjusted by bending the ends of the wires closer or farther apart.—Contributed by C. R. Poole, Los Angeles, Cal.

While automobiling give the engine a rest by advancing the spark and nearly closing the throttle. It is not good practice to run on full throttle for long periods.

Holder for Starting Screws

The tool shown in the sketch is for holding screws when starting them in tapped holes. It consists of a wood

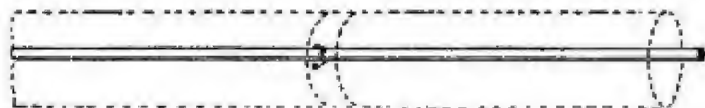


Screw in Holder

handle having two pieces of clock-spring, $\frac{1}{8}$ in. wide, bent at the points, as shown, to spring into the slot of a screw. The manner of using the tool is obvious.—Contributed by Henry Hertiner, Amarillo, Texas.

Fastening Stovepipe Joints

While putting up a stovepipe recently I found that I did not have any place to fasten the guy wires. In their stead I used a 1-in. iron pipe, which I placed in the stovepipe, and fastened each joint with a rivet. A small piece of wire, wrapped a couple of turns around the iron pipe and run through holes in the stovepipe, will hold the

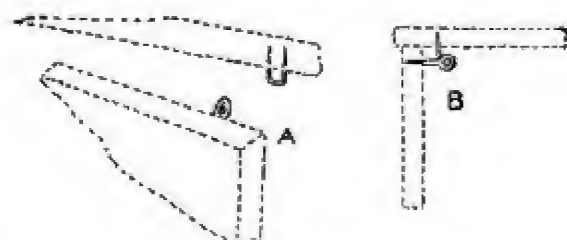


Iron Pipe in Stovepipe

parts together as well as the rivets.—Contributed by Victor Maene, Bustleton, Pa.

Catch for a Small Door

An easily made and very effective catch to hold any small door, as in a washstand, sideboard, etc., is shown in the sketch. It is simply a small screw-eye and an upholstering staple attached as shown at A. The manner in which

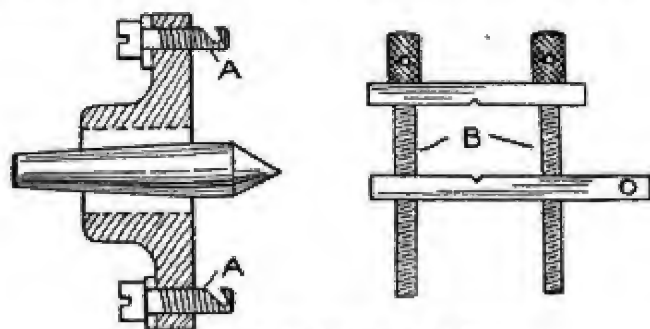


Catch on Door

they hold the door is shown at B.—Contributed by Jos. L. Schreick, Portsmouth, O.

Holding Work on the Center of a Lathe

All that is necessary to use is two fillister head screws, A A, with two coiled springs of even tension. File a



Springs Hold Work on Center

groove in each screw, as shown in the sketch, put one spring on each screw B of the small lathe dog, and when in position it can be readily hooked on the screws in the driving plate, thus holding the work back securely.—Contributed by Arthur W. Andrews, Brooklyn, N. Y.

Coloring Brick

Brick owes its color to the presence of iron in the clay from which it is formed. Usually 5 or 6 per cent of oxide of iron (ferric oxide) will give a deep red color to brick, a higher percentage giving a deeper color. The presence of carbonates of lime and of magnesium will modify the color.

Sharpening a Nail Set

A nail set will become worn in time so that the face will be flat as shown at A. This will allow it to slide off the head of the nail when it is struck with a hammer. If the edge is hammered down, it will form a concave



End of Punch Hammered Over

as shown at B. When hardened, it will work as well as a new one.—Contributed by Albert Hahn, Chicago.

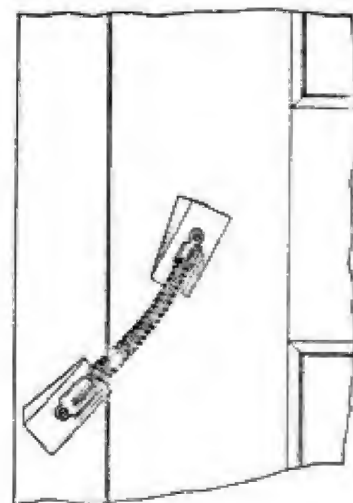
¶An ordinary curling iron makes a very good finger stretcher for kid gloves.

Reflector for an Automobile-Trouble Lamp

A handy reflector for a trouble lamp for automobiles can be made by taking a funnel and putting it over a light bulb and fastening it with insulation tape to prevent a short circuit. We have used this reflector in the shop, and find it cheaper to go to the hardware store and buy a funnel than to buy a reflector at an automobile-supply house.—Contributed by Thos. J. Becker, Kansas City, Mo.

Increasing Efficiency of a Coil Door-Spring

The efficiency of an old-fashioned coil door-spring can be increased by applying two blocks of wood as shown in the sketch. The blocks are cut triangular-shaped. One is fastened to the door and the other to the casing. The spring is applied as shown. This will curve the spring backward a little when the door is closed, and cause the spring to exert constant pressure against drafts on the door.



The manner of holding the spring does not increase the tension, but applies the pressure when the door is closed.—Contributed by Victor Labadie, Dallas, Texas.

Operating Air Pumps

Many engineers start the pump, set it at its normal speed and let it run regardless of the load. The result is that the air pump does a great deal of unnecessary work, and, at times, it is pumping steam to a greater extent than air. This often can be quickly checked by slowing down the air pump materially without any appreciable effect upon the vacuum.



Amateur Mechanics

A Homemade Steam Turbine

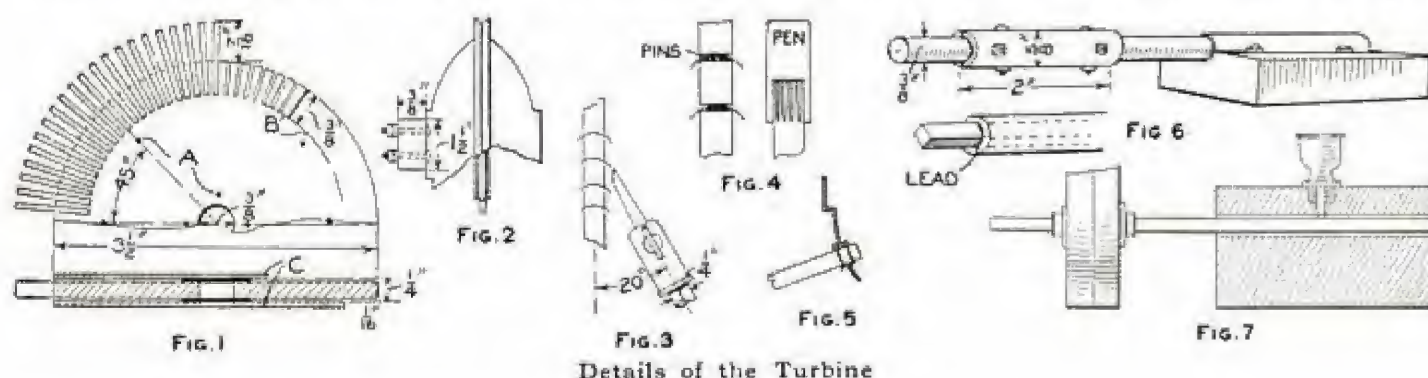
By WILLIAM H. WARNECKE

Lay out on a piece of $\frac{3}{16}$ -in. brass the disk of the turbine and also the line indicating the depth to which the slots are to be cut. Mark the point where a hole is to be drilled for the shaft; also locate the drill holes as shown at A, Fig. 1. After the shaft hole and the holes A are drilled in the disk, it can be used as a template for drilling the side plates C.

The rim of the disk is divided into 53 equal parts and radial lines drawn from rim to line B indicating the depth

around the shaft hole between the disk and the side plates. The side plates are secured by $\frac{1}{8}$ -in. machine screws with nuts. Two nuts are placed on each screw. The nuts should be on the side opposite the inlet valves. It is cheaper to file the shaft hole square, insert a square shaft, and file the ends round for the bearings.

The casing for the disk is made of two enameled iron saucers, Fig. 2, bolted together with a thin piece of asbestos between them to make a tight



Details of the Turbine

of the slots. Slots are cut in the disk with a hacksaw on the radial lines. A small vise is convenient for holding the disk while cutting the slots.

When cutting the disk out of the rough brass, sufficient margin should be left for filing to the true line. The slots should be left in their rough state as they have a better hold on the pens which are used for the blades. The pens are inserted in the slots and made quite secure by forcing ordinary pins on the inside of the pens and breaking them off at the rim as shown in Fig. 4.

After this operation, the side plates are fastened as shown in Fig. 1, C, with the $\frac{1}{32}$ -in. filling pieces first placed

joint. A $\frac{3}{4}$ -in. hole is cut near the edge of one of the saucers for the exhaust. If it is desired to carry the exhaust beyond the casing, a thin pipe can be inserted $\frac{1}{4}$ in. into the hole. Holes are drilled through the pipe on both inside and outside of the casing and pins inserted as shown in Fig. 5. Solder is run around the outside pin to keep the steam from escaping. At the lowest point of the saucer or casing a $\frac{1}{8}$ -in. hole is drilled to run off the water. A wood plug will answer for a stopcock.

Nozzles are made of two stopcocks having a $\frac{1}{8}$ -in. hole. These are connected to a $\frac{3}{8}$ -in. supply pipe. The

nozzles should be set at an angle of 20 deg. with the face of the disk. The nozzle or stopcock will give better results if the discharge end is filed parallel to the face of the disk when at an angle of 20 deg. There should be a space of $\frac{1}{16}$ in. between the nozzle and the blades to allow for sufficient play, Fig. 3.

The bearings are made of $\frac{1}{4}$ -in. brass and bolted to the casing, as shown, with $\frac{1}{8}$ -in. machine screws and nuts. Two nuts should be placed on each screw. The pulley is made by sliding a piece of steel pipe on the engine shaft and fastening it with machine screws

and nuts as shown in Fig. 6. If the shaft is square, lead should be run into the segments.

The driven shaft should have a long bearing. The pulley on this shaft is made of pieces of wood nailed together, and its circumference cut out with a scroll saw. Flanges are screwed to the pulley and fastened to the shaft as shown in Fig. 7.

The bearings are made of oak blocks lined with heavy tin or sheet iron for the running surface. Motion is transmitted from the engine to the large pulley by a thin but very good leather belt.

Homemade Telegraph Key

A simple and easily constructed telegraph key may be made in the following manner: Procure a piece of sheet brass, about $\frac{1}{32}$ in. thick, and cut out a strip $3\frac{1}{2}$ in. long by $\frac{3}{4}$ in. wide. Bend as shown in Fig. 1 and drill a hole for the knob in one end and a hole for a screw in the other. Procure a small wood knob and fasten it in place with a small screw. Cut a strip of the same brass $2\frac{3}{4}$ in. long and $\frac{5}{16}$ in. wide and bend as shown in Fig. 2. Drill two holes in the feet for screws to fasten it to the base, and one hole in the top part for a machine screw, and solder a small nut on the under side of the metal over the hole.

Mount both pieces on a base $4\frac{1}{4}$ by $2\frac{3}{4}$ by $\frac{1}{4}$ in., as in Fig. 3, and where

Fasten the parts down with small brass wood-screws and solder the connections beneath the base. Binding-posts from an old battery cell are used on the end of the base. The screw on top of the arch is used to adjust the key for a long or short stroke.—Contributed by S. V. Cooke, Hamilton, Canada.

Keeping Food Cool in Camps

Camps and suburban homes located where ice is hard to get can be provided with a cooling arrangement herein described that will make a good substitute for the icebox. A barrel is sunk in the ground in a shady place, allowing plenty of space about the outside to fill in with gravel. A quantity of small stones and sand is first put in wet. A box is placed in the hole over the top of the barrel and filled in with clay or earth well tamped. The porous condition of the gravel drains the surplus water after a rain.

The end of the barrel is fitted with a light cover and a heavy door hinged to the box. A small portion of damp sand is sprinkled on the bottom of the barrel. The covers should be left open occasionally to prevent mold and to remove any bad air that may have collected from the contents.—Contributed by F. Smith, La Salle, Ill.

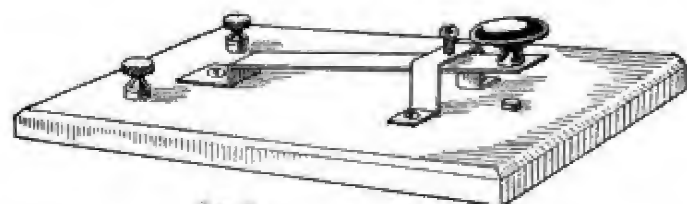


Fig. 3
Brass Key on a Wood Base

the screw of the knob strikes the base when pressed down, put in a screw or brass-headed tack for a contact.

How to Make a Flint Arrowhead

If you live where flints abound, possess the requisite patience and the knack of making things, you can, with the crudest of tools and a little practice, chip out as good arrowheads as any painted savage that ever drew a bow.

Select a piece of straight-grained flint as near the desired shape as possible. It may be both longer and wider than the finished arrow but it should not be any thicker. The side, edge and end views of a suitable fragment are shown in Fig. 1. Hold the piece with one edge or end resting on a block of wood and strike the upper edge lightly with a hammer, a small boulder or anything that comes handy until the piece assumes the shape shown in Fig. 2.

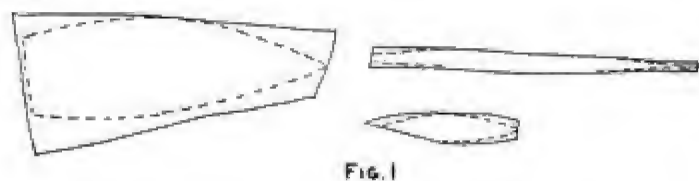


Fig. 1



Fig. 2

The Stone Chipped into Shape



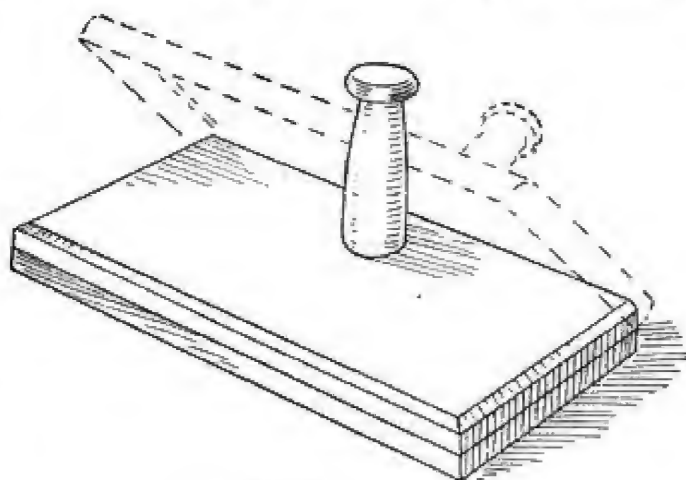
Fig. 3

The characteristic notches shown in the completed arrow, Fig. 3, are chipped out by striking the piece lightly at the required points with the edge of an old hatchet or a heavy flint held at right angles to the edge of the arrow. These heads can be made so that they cannot be distinguished from the real Indian arrowheads.—Contributed by B. Orlando Taylor, Cross Timbers, Mo.

An Opening Handle for a Stamp Pad

A stamp pad is a desk necessity and the cleanliness of one depends on keeping it closed when it is not in use. The opening and closing of a pad requires both hands and consequently the closing of a pad is often neglected in order to avoid soiling the fingers. This trouble can be avoided if the pad is

fitted with a small handle as shown in the sketch. Take the ordinary pad and work the hinge until it opens freely.



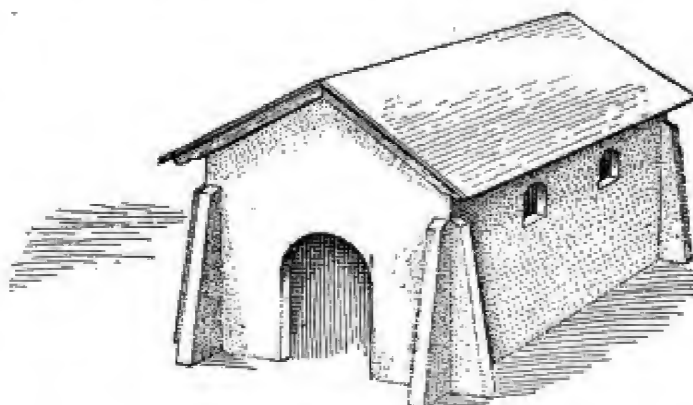
Handle on Cover

If necessary apply a little oil and spread the flanges of the cover slightly.

Saw off the top of a common wood clothespin just above the slot, saving all the solid part. Fasten this to the cover near the back side in an upright position with a screw. A tap on the front side of the pin will turn it over backward until the head rests on the desk thus bringing the cover up in the upright position. When through using the pad, a slight tap on the back side of the cover will turn it down in place—Contributed by H. L. Crockett, Gloversville, N. Y.

Concrete Kennel

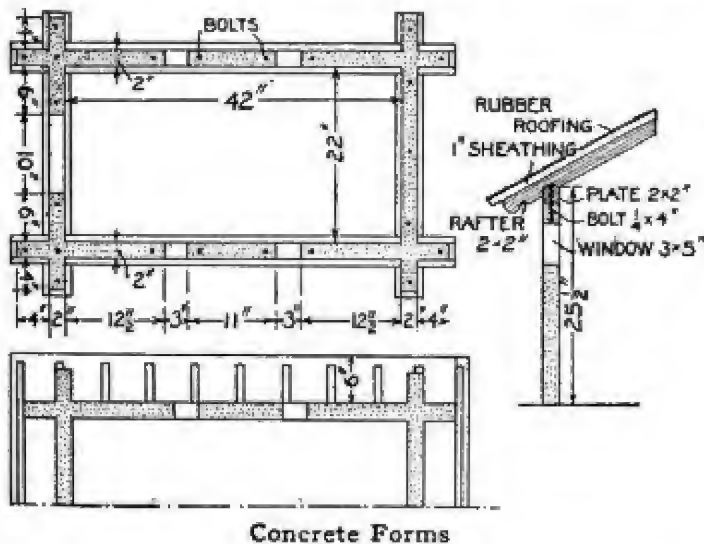
The kennel shown in the illustration is large enough for the usual size of dog. It is cleanly, healthful and more ornamental than the average ken-



Finished Kennel

nel. This mission style would be in keeping with the now popular mission and semi-mission style home, and, with

slight modifications, it could be made to conform with the ever beautiful colonial home. It is not difficult to

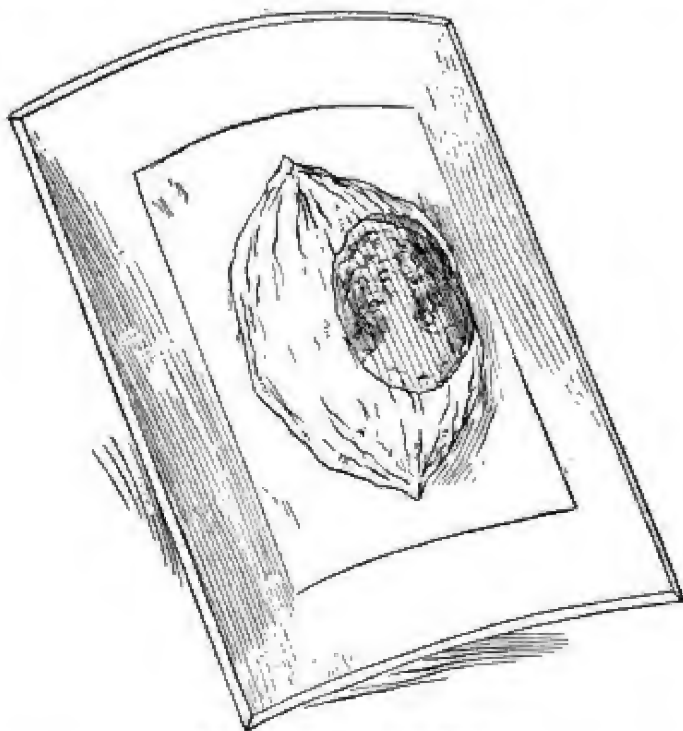


build and will keep in good shape for many years.

The dimensions and the manner of making the forms for the concrete, and the location for the bolts to hold the plate and rafters, are shown in the diagram.—Contributed by Edith E. Lane, El Paso, Texas.

Nutshell Photograph Novelty

Split an English walnut in the center, remove the contents, and scrape out the rough parts. Make an oval



Photograph in the Shell

opening by filing or grinding. If a file is used, it should be new and sharp.

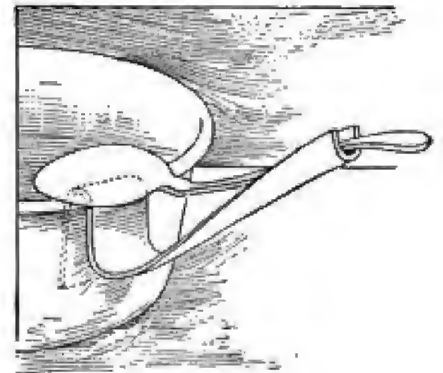
After this is done, take a small half-round file and smooth the edges into shape and good form.

The photograph print should be quite small—less than $\frac{1}{2}$ in. across the face. Trim the print to a size a little larger than the opening in the shell, and secure it in place with glue or paste. It may be well to fill the shell with cotton. Mount the shell on a small card with glue, or if desired, a mount of different shape can be made of burnt woodwork.—Contributed by C. S. Bourne, Lowell, Mass.

Spoonholder on a Kettle

In making marmalade and jellies the ingredients must be stirred from time to time as the cooking proceeds. After

stirring, some of the mixture always remains on the spoon. Cooks often lay the spoon on a plate or stand it



against the cooking utensil with the handle down. Both of these methods are wasteful. The accompanying illustration shows a device made of sheet copper to hold the spoon so that the drippings will return to the cooking utensil. The copper is not hard to bend and it can be shaped so that the device can be used on any pot or kettle.—Contributed by Edwin Marshall, Oak Park, Ill.

Repairing Cracked Gramophone Records

Some time ago I received two gramophone records that were cracked in shipment but the parts were held together with the paper label. As these were single-faced disk records, I used the following method to stick them together: I covered the back of one with shellac and laid the two back to back centering the holes with the crack in one running at right angles

to the crack in the other. These were placed on a flat surface and a weight set on them. After several hours' drying, I cleaned the surplus shellac out of the holes and played them.

As the needle passed over the cracks the noise was hardly audible. These records have been played for a year and they sound almost as good as new.—Contributed by Marion P. Wheeler, Greenleaf, Oregon.

New Use for a Vacuum Cleaner

An amateur mechanic who had been much annoyed by the insects which were attracted to his electric lights found a solution in the pneumatic moth-trap described in a recent issue of Popular Mechanics. He fixed a funnel to the end of the intake tube of a vacuum cleaner and hung it under a globe. The insects came to the light, circled over the funnel and disappeared. He captured several pounds in a few hours.—Contributed by Geo. F. Turl, Canton, Ill.

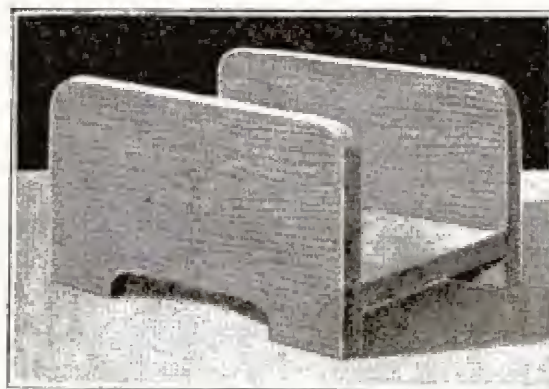
Filtering with a Small Funnel

In filtering a large amount of solution one usually desires some means other than a large funnel and something to make the watching of the process unnecessary. If a considerable quantity of a solution be placed in a large bottle or flask, and a cork with a small hole in it inserted in the mouth, and the apparatus suspended in an inverted position over a small funnel so that the opening of the cork is just below the water level in the funnel, the filtering process goes on continuously with no overflow of the funnel.

As soon as the solution in the funnel is below the cork, air is let into the flask and a small quantity of new solution is let down into the funnel. The process works well and needs no watching, and instead of the filtrate being in a large filter paper, it is on one small piece and can be handled with ease.—Contributed by Loren Ward, Des Moines, Iowa.

A Postcard Rack

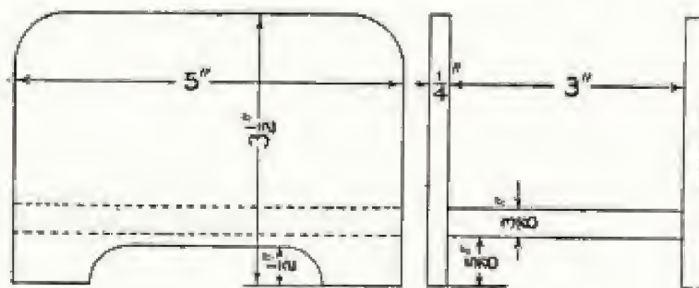
The illustration shows a neat rack for postcards. Those having homes



Finished Rack

with mission-style furniture can make such a rack of the same material as the desk, table or room furnishings and finish it in the same manner.

The dimensions are given in the detail sketch. The two ends are cut from $\frac{1}{4}$ -in. material, the bottom being $\frac{3}{8}$ in. thick. Only three pieces are required, and as they are simple in design, anyone can cut them out with a



Details of the Rack

saw, plane and pocket knife.—Contributed by Wm. Rosenberg, Worcester, Mass.

Substitute Shoe Horn

A good substitute for a shoe horn is a handkerchief or any piece of cloth used in the following way: Allow part of the handkerchief or cloth to enter the shoe, place the toe of the foot in the shoe so as to hold down the cloth, and by pulling up on the cloth so as to keep it taut around the heel the foot will slide into the shoe just as easily as if a shoe horn were used.—Contributed by Thomas E. Dobbins, Glenbrook, Conn.

Building a Small Photographic Dark Room

In building a photographic dark room, it is necessary to make it perfectly light-tight, the best material to use being matched boards. These boards are tongued and grooved and when put together effectually prevent the entrance of light.

The next important thing to be considered is to make it weather-tight, and as far as the sides are concerned the matched boards will do this also, but it is necessary to cover the roof with felt or water-proof paper.

The best thickness for the boards is 1 in., but for cheapness $\frac{3}{4}$ in. will do as well, yet the saving is so little that the 1-in. boards are preferable.

The dark room shown in the accompanying sketch measures 3 ft. 6 in. by 2 ft. 6 in., the height to the eaves being 6 ft. Form the two sides shown in Fig. 1, fixing the crosspieces which hold the boards together in such positions that the bottom one will act as a bearer for the floor, and the second one for the developing bench. Both sides can be put together in this way, and both exactly alike. Keep the ends of the crosspieces back from the edges of the boards far enough to allow the end boards to fit in against them.

One of the narrow sides can be formed in the same way, fixing the crosspieces on to correspond, and then these three pieces can be fastened together by screwing the two wide sides on the narrow one.

Lay the floor next, screwing or nailing the boards to the crosspieces, and making the last board come even with the ends of the crosspieces, not even with the boards themselves. The single boards can then be fixed, one on each side of what will be the doorway, by screwing to the floor, and to the outside board of the sides. At the top of the doorway, fix a narrow piece between the side boards, thus leaving a rectangular opening for the door.

The roof boards may next be put on, nailing the to each other at the ridge, and to the sides of the room at the

outsides and eaves. They should overhang at the sides and eaves about 2 in., as shown in Figs. 3 and 4.

One of the sides with the crosspieces in place will be as shown in Fig. 2 in section, all the crosspieces and bearers intersecting around the room.

The door is made of the same kind of boards held together with crosspieces, one of which is fastened so as to fit closely to the floor when the door is hinged, and act as a trap for the light. The top crosspiece is also fastened within 1 in. of the top of the door for the same reason.

Light traps are necessary at the sides and top of the door. That at the hinged side can be as shown at A, Fig. 5, the closing side as at B, and the top as at C in the same drawing. These are all in section and are self-explanatory. In hinging the door, three butt hinges should be used so as to keep the joint close.

The fittings of the room are as shown sectionally in Fig. 6, but before fixing these it is best to line the room with heavy, brown wrapping paper, as an additional safeguard against the entrance of light.

The developing bench is 18 in. wide, and in the middle an opening, 9 by 11 in., is cut, below which is fixed the sink. It is shown in detail in Fig. 7, and should be zinc lined.

The zinc should not be cut but folded as shown in Fig. 8, so that it will fit inside the sink. The bench at each side of the sink should be fluted (Fig. 9), so that the water will drain off into the sink. A strip should be fixed along the back of the bench as shown in Figs. 6 and 9, and an arrangement of slats (Fig. 10), hinged to it, so as to drop on the sink as in Fig. 6, and shown to a larger scale in Fig. 11.

A shelf for bottles and another for plates, etc., can be fixed above the developing bench as at D and E (Fig. 6) and another as F in the same drawing. This latter forms the bottom of the tray rack, which is fixed on as shown

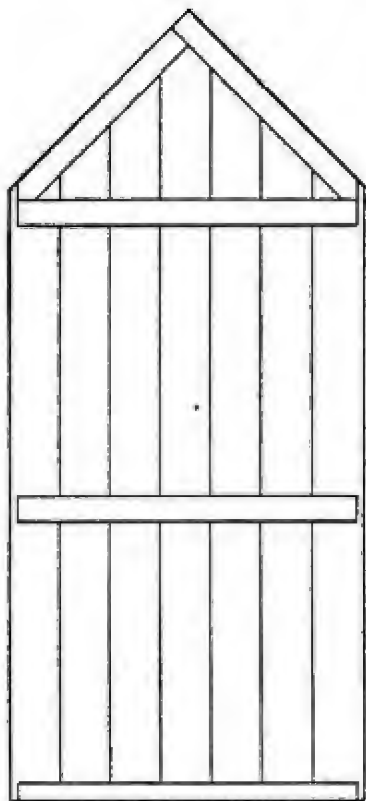


Fig. 1



Fig. 2

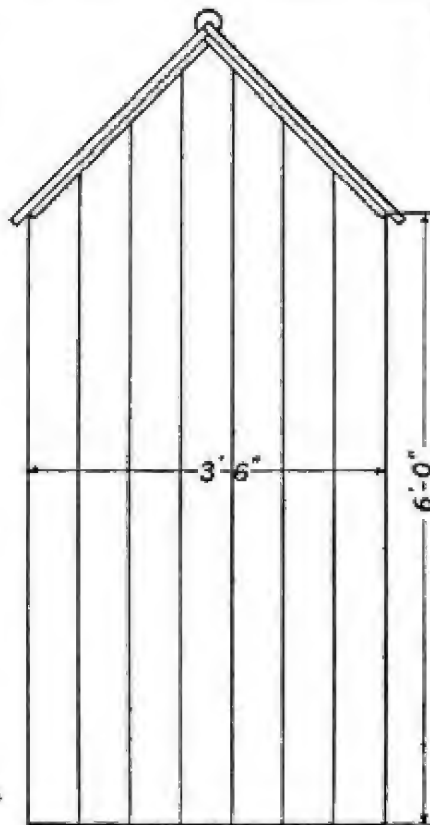


Fig. 3

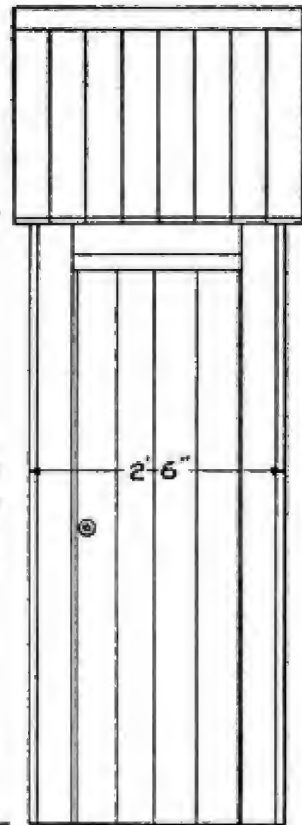


Fig. 4

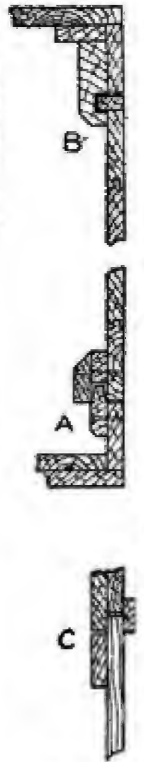


Fig. 5

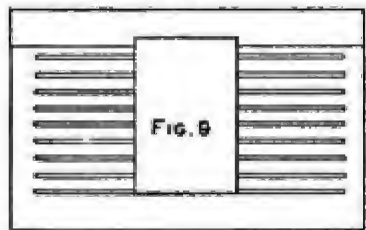


Fig. 9

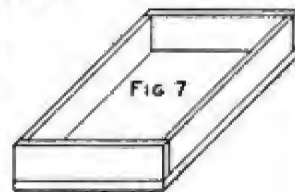


Fig. 7



Fig. 10



Fig. 15



Fig. 20



Fig. 19



Fig. 18



Fig. 17



Fig. 11

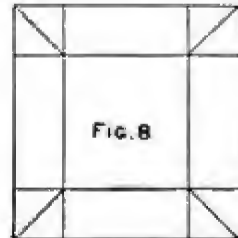


Fig. 8

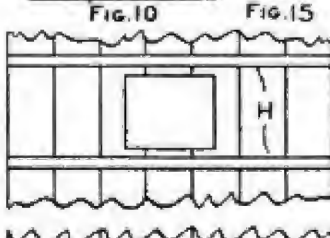


Fig. 16

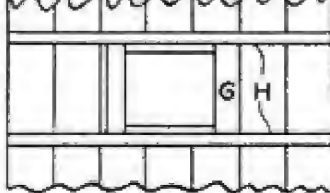


Fig. 13

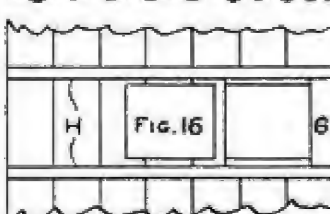


Fig. 12

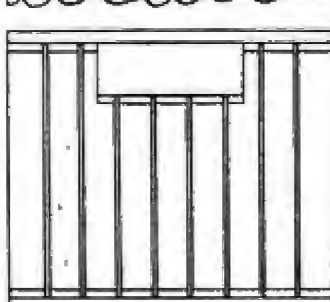


Fig. 14

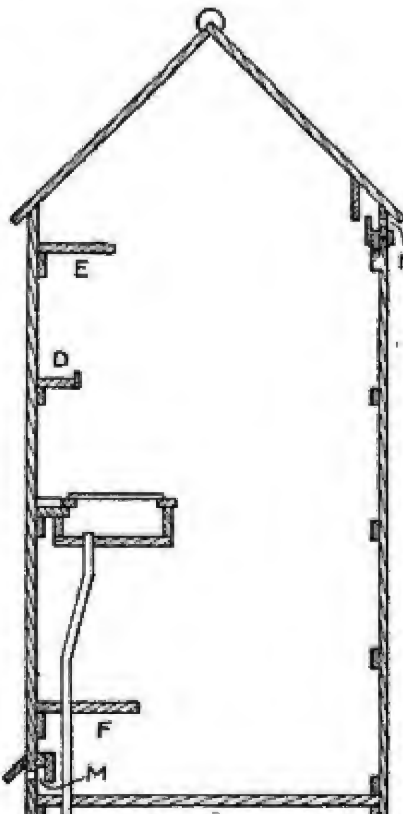


Fig. 6

Details of the Dark Room

in Fig. 13. The divisions of the tray rack are best fitted loosely in grooves formed by fixing strips to the shelves and under the bench and sink as in Fig. 13.

Extra bearing pieces will be wanted for the shelves mentioned above, these being shown in Fig. 14. The window is formed by cutting an opening in the side opposite the door, and fixing in it a square of white glass with strips of wood on the inside and putty on the outside, as in Fig. 15. A ruby glass is framed as shown at G, Fig. 16, and arranged to slide to and fro in the grooved runners H, which makes it possible to have white light, as at I, or red light as at K, Fig. 16. The white glass with runners in position is shown at L in the same drawing, but not the red glass and frame. Ventilation is arranged for by boring a series of holes near the floor, as at M, Fig. 6, and near the roof as at N in the same drawing, and trapping the light without stopping the passage of air, as shown in the sections, Fig. 17.

The finish of the roof at the gables is

shown in Fig. 18, the strip under the boards holding the felt in position when folded under, and the same is true of the roll at the top of the roof in Fig. 19.

The house will be much strengthened if strips, as shown in Fig. 20, are fastened in the corners inside, after lining with brown paper, screwing them each way into the boards.

The door may have a latch or lock with a knob, but should in addition have two buttons on the inside, fixed so as to pull it shut tightly at top and bottom. A waste pipe should be attached to the sink and arranged to discharge through the floor. A cistern with pipe and tap can be fastened in the top of the dark room, if desired, or the room may be made with a flat roof, and a tank stand on it, though this is hardly advisable.

It is absolutely necessary that the room be well painted, four coats at first is not too many, and one coat twice a year will keep it in good condition.

A brick foundation should be laid so that no part of the room touches the ground.

The Versatile Querl

"Querl" is the German name for a kitchen utensil which may be used as an egg-beater, potato-masher or a lemon-squeezer. For beating up an egg in a glass, mixing flour and water, or stirring cocoa or chocolate, it is better than anything on the market.

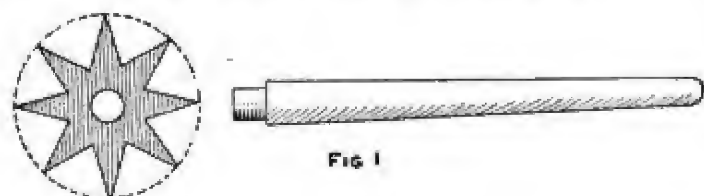


Fig. 1

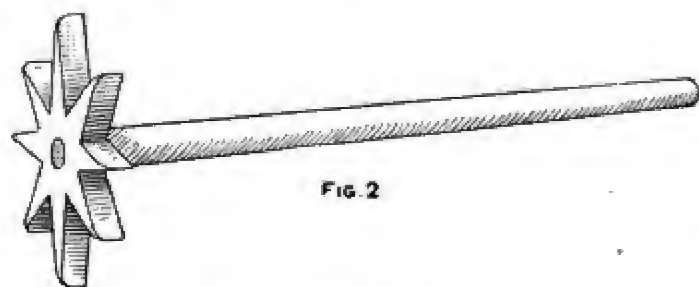


Fig. 2

Querl Made of Wood

This utensil is made of hardwood, preferably maple or ash. A circular

piece about 2 in. in diameter is cut from $\frac{1}{2}$ -in. stock and shaped like a star as shown in Fig. 1, and a $\frac{3}{8}$ -in. hole bored in the center for a handle. The handle should be at least 12 in. in length and fastened in the star as shown in Fig. 2.

In use, the star is placed in the dish containing the material to be beaten or mixed and the handle is rapidly rolled between the palms of the hands.—Contributed by W. Karl Hilbrich, Erie, Pennsylvania.

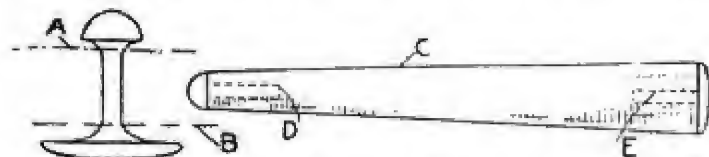
An Emergency Soldering Tool

Occasionally one finds a piece of soldering to do which is impossible to reach with even the smallest of the ordinary soldering irons or coppers. If a length of copper wire, as large as the job will permit and sufficiently long to admit being bent at one end to form a rough handle, and filed or dressed to a point on the other, is heated and tinned exactly as a regular

copper should be, the work will cause no trouble on account of inaccessibility.—Contributed by E. G. Smith, Eureka Springs, Ark.

Smoothing Paper after Erasing

When an ink line is erased the roughened surface of the paper should be smoothed or polished so as to prevent the succeeding lines of ink from spreading. A convenient desk accessory for this purpose can be made of a short



Collar Button Ends in Wood Stick

piece of hardwood and two bone collar buttons.

File off the head of one button at A and the base from another at B. Bore a small hole D and E in each end of the wood handle C and fasten the button parts in the holes with glue or sealing wax. The handle can be left the shape shown or tapered as desired. The small end is used for smoothing small erasures and the other end for larger surfaces.

A Cherry Seeder

An ordinary hairpin is driven part way into a small round piece of wood, about $\frac{3}{8}$ in. in diameter and 2 or $2\frac{1}{2}$ in. long, for a handle, as shown in the sketch. The hairpin should be a very



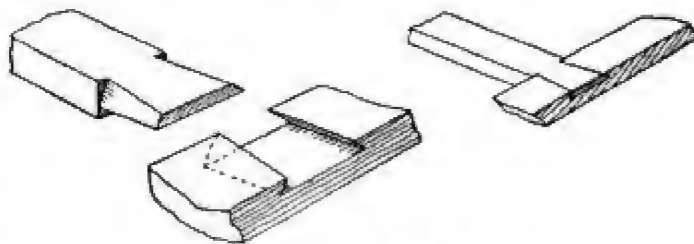
Hairpin in Stick

small size. To operate, simply insert the wire loop into the cherry where the stem has been pulled off and lift out the seed.—Contributed by L. L. Schweiger, Kansas City, Mo.

A Dovetail Joint

The illustration shows an unusual dovetail joint, which, when put together properly is a puzzle. The tenon or tongue of the joint is sloping on

three surfaces and the mortise is cut sloping to match. The bottom surface of the mortise is the same width at



Shape of Tenon and Mortise

both ends, the top being tapering toward the base of the tongue.—Contributed by Wm. D. Mitchell, Yonkers, New York.

Base for Round-End Bottles

The many forms of round-bottomed glass bottles used in chemical laboratories require some special kind of support on which they can be safely placed from time to time when the chemist



Fig. 1

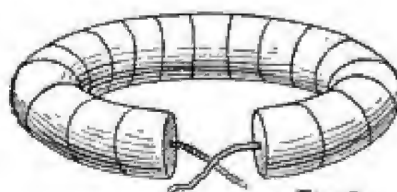


Fig. 2

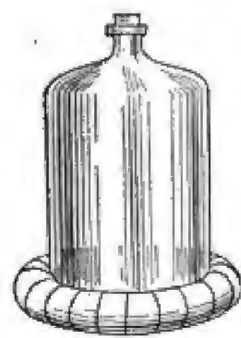


Fig. 3

Base Made of Corks

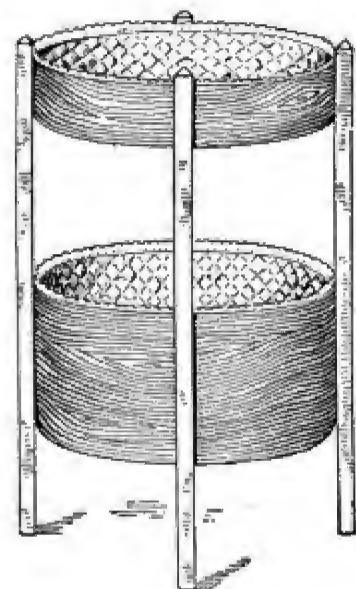
does not, for the moment, need them. These supports should not be made of any hard material nor should they be good conductors of heat, as such qualities would result in frequent breakage.

A French magazine suggests making the supports from the large corks of glass jars in which crystal chemicals are usually supplied from the dealers. The manner of making them is clearly shown in the sketch. Each cork is cut as in Fig. 1 and placed on a wire ring (Fig. 2) whose ends are twisted together and the last section of cork is cut through from the inner side to the center and thus fitted over the wire covering the twisted ends, which binds them together. The corks in use are shown in Fig. 3.

Homemade Work Basket

Secure a cheese box about 12 in. high and 15 in. or more in diameter. It will pay you to be careful in selecting this box. Be sure to have the cover. Score the wood deeply with a carpenter's gauge inside and out $3\frac{1}{2}$ in. from the top of the box. With repeated scoring the wood will be almost cut through or in shape to finish the cut with a knife. Now you will have the box in two pieces. The lower part, $8\frac{1}{2}$ in. deep over all, we will call the basket, and the smaller part will be known as the tray.

Remove the band from the cover and cut the boards to fit in the tray flush with the lower edge, to make the bottom. Fasten with $\frac{3}{4}$ -in brads. The kind of wood used in making these boxes cracks easily and leaves a rough surface which should be well sandpapered.



The four legs are each $\frac{3}{4}$ in. square and $30\frac{1}{2}$ in. long. The tops should be beveled to keep them from splintering at the edges. With a string or tape measure, find the circumference of the tray or basket and divide this into four equal parts, arranging the lap seam on both to come midway between two of the marks. When assembling, make these seams come between the two back legs.

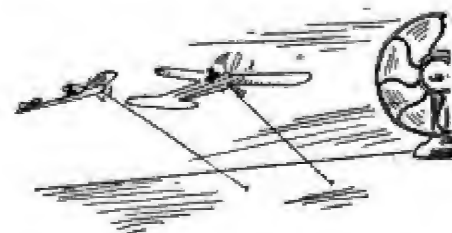
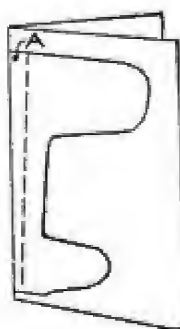
The tray is placed $11\frac{1}{4}$ in. from the top end and the basket $6\frac{3}{4}$ in. from the bottom end of the legs. Notch the legs at the lower point about $\frac{1}{8}$ in. deep and $1\frac{1}{4}$ in. wide to receive the band at the lower end of the basket. Fasten with $\frac{3}{4}$ -in. screws, using four to each leg, three of which are in the basket. Insert the screws from the inside of the box into the legs.

Stain the wood before putting in the

lining. If all the parts are well sandpapered, the wood will take the stain nicely. Three yards of cretonne will make a very attractive lining. Cut two sheets of cardboard to fit in the bottom of the tray and basket. Cover them with the cretonne, sewing on the back side. Cut four strips for the sides from the width of the goods $5\frac{1}{2}$ in. wide and four strips 10 in. wide. Sew them end to end and turn down one edge to a depth of 1 in. and gather it at that point,—also the lower edge when necessary. Sew on to the covered cardboards. Fasten them to the sides of the tray and basket with the smallest upholsterers' tacks. The product of your labor will be a very neat and useful piece of furniture.—Contributed by Stanley H. Packard, Boston, Mass.

A Window Display

A novel and attractive aeroplane window display can be easily made in the following manner: Each aeroplane is cut from folded paper, as shown in the sketch, and the wings bent out on the dotted lines. The folded part in the center is pasted together. Each aeroplane is fastened with a small thread from the point A as shown. A figure of an airman can be pasted to each aeroplane. One or more of the aeroplanes can be fastened in the blast of an electric fan and kept in flight the same as a kite. The fan can be concealed to make the display more real. When making the display, have the background of such



Paper Aeroplanes in Draft

a color as to conceal the small threads holding the aeroplanes.—Contributed by Frederick Hennighausen, Baltimore, Md.

The Construction of a Simple Wireless Telephone Set

By A. E. ANDREWS

In Two Parts—Part II

If two coils of wire be placed parallel to each other as shown in Fig. 6, and a current be passed through the winding of one of them, say A, a part of the magnetic lines of force created by this current will pass through the other coil B. These lines of magnetic force must cut across the turns of wire of the coil in which there is no current as the magnetic field is being created, and as a result there will be an electrical pressure produced in the winding of the coil carrying no current. When the current in coil A is discontinued, the magnetic field created by this current is destroyed or it contracts to zero, and the magnetic lines again cut the various turns composing the winding of coil B. The direction in which the magnetic lines of force and the winding of coil B move with respect to each other is just the reverse, when the current in the winding of coil A is increasing, to what it is when the current in the winding of the coil A is decreasing. Any change in the value of the current in the winding of coil A will result in a change in the number of magnetic lines of force linked with the winding of the coil B, and as a result of this change in the number of lines linked with the winding of coil B there will be an induced electrical pressure set up in coil B. The direction of this induced electrical pressure will depend upon whether the current in the winding of coil A is increasing or decreasing in value. When the current in the winding of coil A is increasing in value, the electrical pressure induced in the winding of coil B will be in such a direction that the current produced by this induced electrical pressure will pass around the winding of coil B in the opposite direction to that in which the current passes around the winding of coil A. Or the current produced by the induced electrical pressure tends to produce a magnetic field opposite in

direction to the one created by the current in the winding of coil A. When the current in the winding of A is decreasing in value, the induced pressure in the winding of the coil B is just the reverse of what it was in the previous case and the current produced by this induced

pressure passes around the winding of the coil B in the same direction as the current passes around the winding of coil A. The current produced by the

induced electrical pressure aids the current in the winding of coil A in producing a magnetic field. In general the current resulting from the induced pressure always passes around the circuit in such a direction as to produce a magnetic effect which will oppose a change in the value of the magnetic field causing the induced electrical pressure.

There will be an induced pressure in the winding of coil B, due to a change in the value of the current in the winding of coil A, as long as the coil B remains in the magnetic field of the coil A and its plane is not parallel to magnetic lines; or, in other words, coil B must always be in such a position that some of the magnetic lines created by the current in coil A will pass through the winding of coil B.

If a telephone transmitter and a battery be connected in series with the winding of coil A, a fluctuating or varying current can be made to pass through the winding by causing the dia-

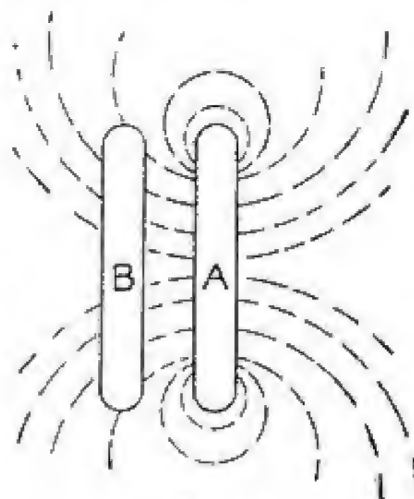


Fig. 6

phragm of the transmitter to vibrate by speaking into the mouthpiece of the transmitter. This varying current will set up a varying magnetic field and there will be an induced electrical pres-

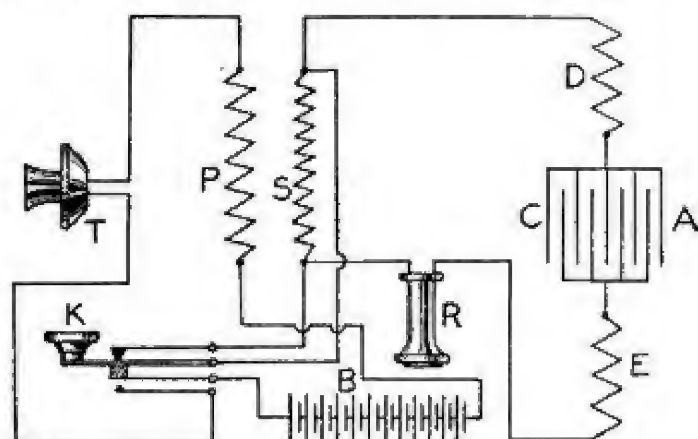


Fig. 7—Sending and Receiving Equipment

sure set up in coil B, if it be properly placed with respect to coil A. A receiver connected in series with the winding of coil B will be subjected to the action of a varying current due to the induced electrical pressure in the winding of coil B and as a result, the diaphragm of the receiver will vibrate in unison with that of the transmitter, and speech can thus be transmitted. The connection just described should be somewhat modified and a little more equipment used in order to give the best results.

Figure 7 shows the complete sending and receiving equipment, a complete outfit of this kind being required for each station. The transmitter T and the receiver R may be an ordinary local battery transmitter and receiver, although a high-resistance receiver will give better results. The induction coil with the windings, marked P and S, may be any commercial type of induction coil as used in a magneto telephone instrument, but a coil with a high-wound secondary will give better results. The push button K is to be used in closing the transmitter circuit when the set is being used for transmitting, the key being depressed, and for shorting out the high resistance secondary winding when the set is used in receiving, the key being

in the normal position. Ten dry cells should be connected in series and used to supply current to the transmitter circuit, as shown by B in the figure. The receiver R, secondary winding of the induction coil S, and the winding of coil A used in transmitting and receiving the magnetic effects, are all connected in series. The winding of the coil A consists of two parts, D and E, as shown in the figure, with two of their ends connected together by means of a condenser, C, having a capacity of about 2 micro-farads. Each of these parts should consist of about 200 turns of No. 22 gauge silk-covered copper wire, wound on an ordinary bicycle rim. The inside end of one winding should be connected to the outside of the other by means of the condenser, the two coils being wound in the same direction. The condenser C can be procured at a small cost from almost any telephone company.

To talk, two of the instruments are placed 25 or 30 ft. apart, and they may be placed in different rooms as walls and other ordinary obstructions that do not interfere with the production of the magnetic field about the transmitting coil, have no effect upon the operation. Pressing the button K at the transmitting station, closes the transmitter circuit and removes the shunt from about the secondary winding of the induction. Any vibration of the transmitter will cause a varying current to pass through the primary winding P, which in turn induces an electrical pressure in the secondary winding S, and this pressure causes a varying current to pass through the coil A. The varying current in the winding of the coil A produces a varying magnetic field which acts upon the receiving coil, inducing an electrical pressure in it and producing a current through the receiver at the receiving station.

A filing coherer, adapted to close a local relay circuit and ring an ordinary bell, may be used with the sets just described for signaling between stations.

INTERESTING PATENTS, PRACTICAL OR UNIQUE

DEVICE AIDS IN HEMMING—A Salt Lake City inventor has recently been granted a patent on a cloth holder which he calls a hemmer. This device, shown in Fig. 1, facilitates the hemming of linen by hand and enables the whip stitch to be taken without danger of sticking the finger with the needle. It also holds the cloth firmly in position and presents a straight edge for hemming. The linen to be hemmed is folded in the usual way, and then the hemmer is placed over the fold as shown in the first drawing. The stitch is whipped along the tight straight edge of cloth which shows above the hemmer.

DISPENSING VESSEL FOR SEVERAL BEVERAGES—A dispensing vessel in which three different beverages may be carried and discharged separately through the one spout is shown in Fig. 2. Vertical partitions form three compartments, through all of which the spout extends. Spring-seated valves, operated by flexible connections passing over pulleys to the back of the receptacle just above the handle, close or open the passages between each compartment and the spout.

CLINCHER GAFF FOR FISHERMEN—A clincher gaff controlled by one hand and designed to take the place of a landing net is shown in Fig. 3. It will grip and hold any fish from $\frac{1}{2}$ to 20 lb., and it is claimed that its grip leaves no ugly holes or tears on the fish. A spring holds the jaws open, but when the fish is touched the user closes his hand, thus causing the jaws to shut and grip the fish like a vise.

"FLYTRAP" AEROPLANE—This curiously shaped aeroplane (Fig. 4), which resembles an old-fashioned flytrap inverted, or the lower half of a Chinese lantern, is the idea of a Columbus, Ohio, inventor, who believes sufficiently in its merits to have it patented. The lifting surface of the machine consists of a series of annular planes of progressively increasing diameters arranged one above the other.

ADJUSTABLE CAKE PAN—Figure 5 is an adjustable cake pan comprising a bottom, and a body portion capable of being adjusted to varying diameters. The body portion is held securely at the diameter to which it is adjusted by means of tongues engaging with notches. The diameter of the pan may be readjusted at any time during the baking process.

MINER'S BREATHING MASK—An ingenious means of assembling and carrying the different parts necessary in the use of a respirator for operation in gas-filled mines, or under other like conditions, is shown in Fig. 6. The different parts are assembled in a waistcoat, having an inflatable reservoir in the back portion, and three pockets on the front, of which the upper holds a receptacle for the absorbent, and the two others, gas-containers. Tubes connect the face mask with the former and the inflatable reservoir, and the reservoir with the gas-containers.

FOLDING DECAY DUCK—Figure 7 shows an ingenious folding decoy duck both folded and extended. This decoy is made of canvas, has no levers or cranks, and does not require air pressure for opening. This is done by means of two wire-spring supports, one for the head and one for the tail, the only other parts of the decoy being a wooden float, the head block, and the canvas cover. It automatically expands when the anchor is unwound, and will come right side up in the water no matter how carelessly tossed out.

INDIVIDUAL LEMON OR ORANGE SQUEEZER—A handy device for afternoon teas and other like functions is shown in Fig. 8. It consists of a device for squeezing the juice out of the small slices into which lemons are cut when lemon juice is used instead of cream in tea. It may also be used for squeezing juice from orange carpeles.

SPRAYER—Figure 9 is a spraying apparatus which may be wheeled along a row of plants or small trees as shown. The top of the tank is adapted to serve as a platform. The delivery pipe has a pair of downwardly projecting arms, each of which is provided with four nozzles. The delivery pipe may be swung to either side of the tank.

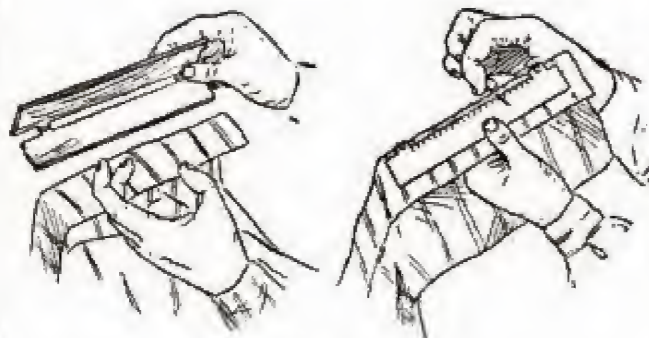


Fig. 1

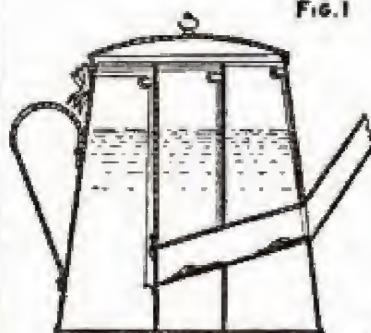


Fig. 2

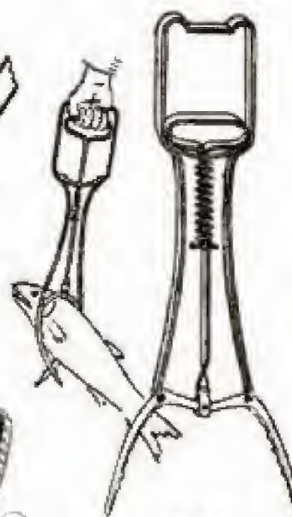


Fig. 3

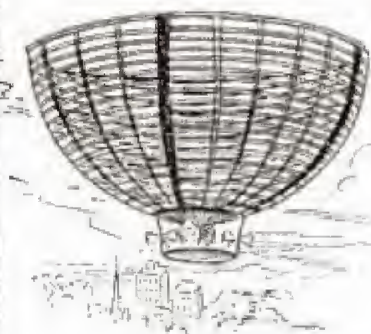


Fig. 4

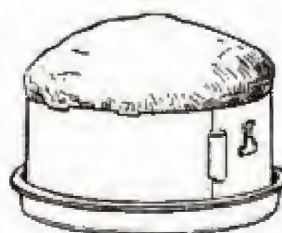


Fig. 5



Fig. 6

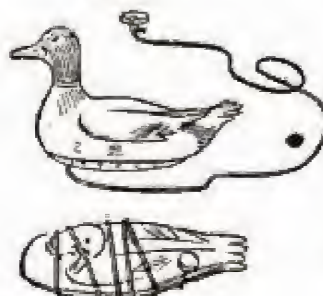


Fig. 7

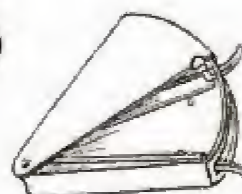


Fig. 8

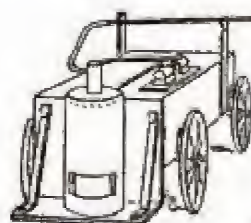


Fig. 9

TWO of the more impressive sights of a railroad grading camp are the marvelous alacrity of the men in responding to the call for dinner and their unparalleled quickness in wrapping themselves around their grub. During construction of the new lines of the Louisville & Nashville in Kentucky, an old farmer furnished one of the grading camps with vegetables. He often arrived at the camp at meal time and was always greatly impressed with the voracity of the men. The work was hard and when the call for dinner was given every man made a rush for the table and the food disappeared in quick time. One day a workman on his way to the table tripped on the root of a tree and fell. He lay all sprawled out making no attempt to rise. The farmer in great concern rushed to him. "Are you hurt, are you hurt?" he asked anxiously. "No," answered the man. "Well, why don't you get up and go to your dinner?" "No use," returned the other, sadly, "It's too late now."—Engineering & Contracting.

"How does your husband keep occupied during his vacation?"

"Oh, he's chauffeur of an electric fan."—Louisville Courier-Journal.

Robert Underwood Johnson, the well-known poet and editor, declared at the University of New York's commencement that New York as a literary center was ridiculous—that nowhere in this country was poetry more appreciated than in Boston, and nowhere less than in New York.

"In fact," said Mr. Johnson, "afterward, 'New York's love of poetry is about equal to the Earlham College boy's love of languages.'"

"In my sophomore year at Earlham this lad was visited by his mother.

"'Well, my dear,' she said to him, 'what languages have you decided to take up here?'"

"'I have decided to take up Pietish,' he replied.

"'Pietish?' said his puzzled mother. 'Why Pietish?'"

"'Only five words of it remain,' said he."—Los Angeles Times.

Wigg—Henpekke has bought a motorboat and named it after his wife.

Wagg—Can't manage it, eh?—Philadelphia Record.

"It is said that impetuous people have black eyes."

"Yes, and if they don't have them, they are apt to get them."—New York Mail.

"What did you do with the steam gauge?" asked the superintendent of the lumber mill. "Oh!" replied the darky engineer. "Do you mean that thar ole clock? I takened it off an' throwed it away. It won't keep time, nohow."—Power.

Olaf Larson, working in a warehouse, backed into an elevator shaft and fell down five stories with a load of boxes. Horror-stricken, the other employees rushed down the stairs, only to find him picking himself unharmed out of the rubbish.

"Ess de boss mad?" he whispered cautiously. "Tal' 'em Ay had to come down for nails anyway."—Success Magazine.

The teacher had been reading to the class about the great forests of America.

"And now, boys," she announced, "which one of you can tell me the pine that has the longest and sharpest needles?"

Up went a hand in the front row.

"Well, Tommy?"

"The porcupine?"—London Tit-Bits.

Hercules had been driven in a taxicab to the Augean stables and told to get busy.

"What's the use," he bitterly muttered, "just as soon as I get 'em cleaned up they'll be turned into a garage."

Nevertheless he fell to work.—Cleveland Plain Dealer.

A St. Louis traveling man, making his first trip through North Dakota, woke up one May morning to find the ground white with snow.

"For heaven's sake," he asked the hotel clerk disgustedly, "when do you have summer out in this God-forsaken country?"

"I don't know," replied the clerk. "I have only been here eleven months."—Success.

Possibly there are no more interesting mechanical plants to visit anywhere than the big watch factories, and so constant are the applications from visitors that a force of guides is kept in readiness to pilot parties through the shops and explain the work of the almost human machines which form the bits of metal into perfect watch parts. One of the factories, noted for its attractive female operatives, might as well advertise at wholesale for more guides, as they will surely be needed when it becomes known that the following notice was recently posted in the shops: "Please Leave All Wearing Apparel in the Cloakroom."—Manufacturing Jeweler.

"I wouldn't miss the pyramids for worlds."

"I am glad to see somebody interested in research."

"It isn't that. I want to have my photograph taken standing in front of the main dump."—Washington Herald.

"Tell me," said the customs inspector, "have you anything dutiable concealed about your person?"

"Well," came in a weak voice from the pale passenger, "if I swallowed anything of that sort I can assure you that I haven't."—Yonkers Statesman.

Apropos of the numerous accidents that befall foreign submarines, Lewis Nixon, the eminent ship-builder, said at the Union club in New York.

"Two French government officials were once discussing naval affairs.

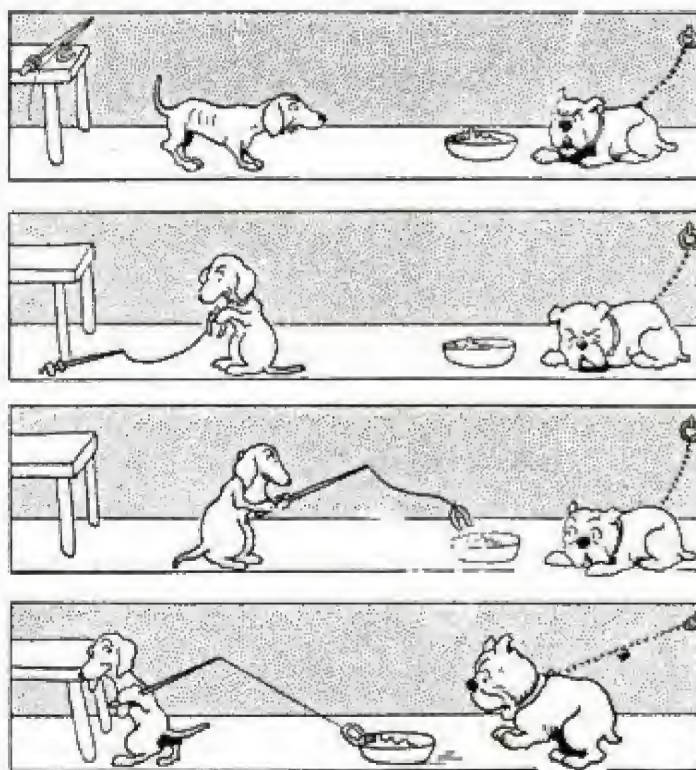
"'To what account,' said the first, 'had our new submarines, the 'X,' and 'XI,' best be charged?'"

"'To the sinking fund, of course,' was the reply."—Detroit Free Press.

"There's a fool-proof aeroplane on the market."

"Good. What's its main characteristic?"

"It won't fly."—Cleveland Plain Dealer.



—Pele Melo

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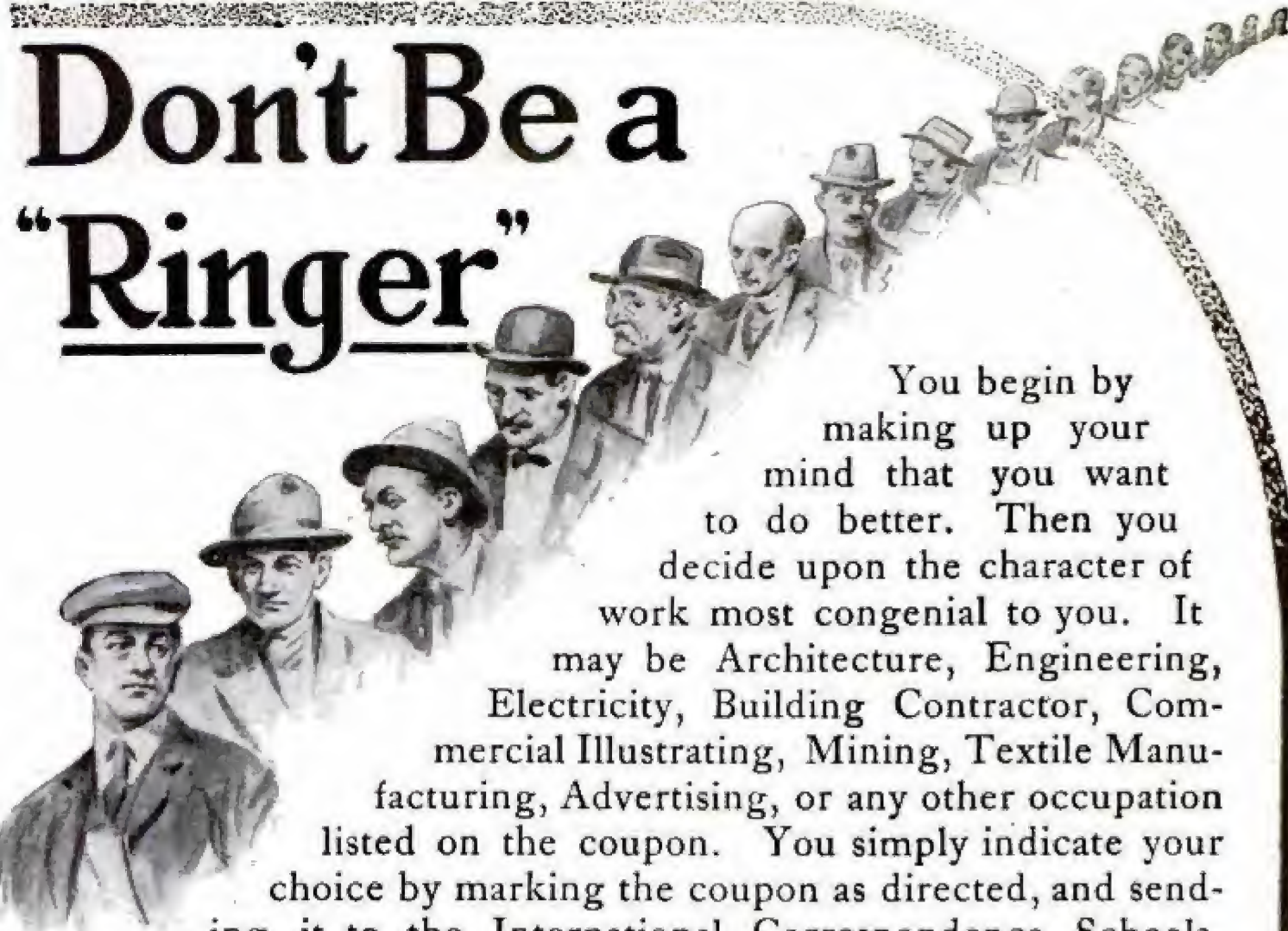
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Name _____

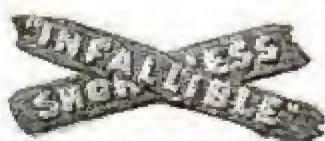
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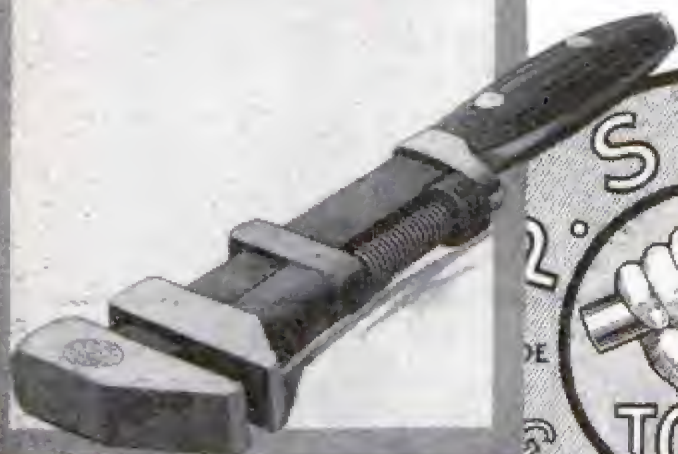
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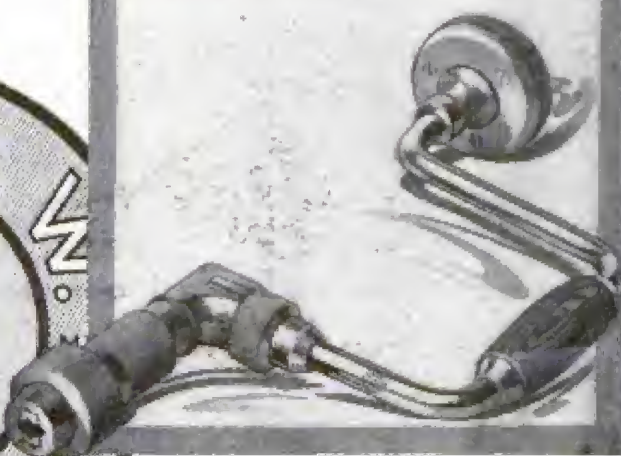
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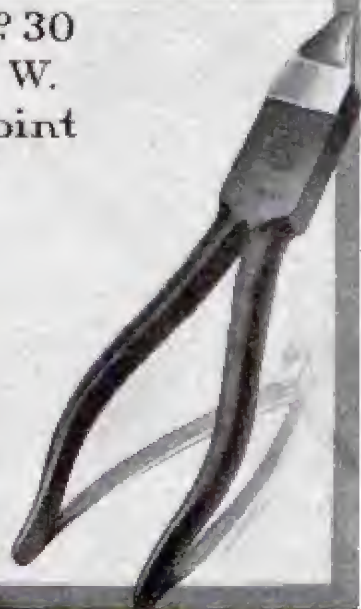
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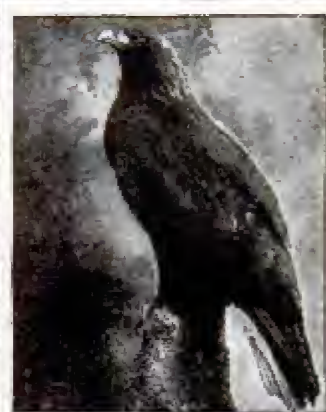


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This advertisement is for every *sportsman* and *nature lover*, everywhere. *Write to-day. Send the coupon* for our *free books*. They contain something of great value to hunters, trappers and all people who love the out-of-doors. *You* should have this book. *Write for it today.*

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If so, you should be able to save your beautiful and valuable trophies. *We can teach you how.* We have taught over 35,000 of the best sportsmen of the country, and they are now doing their own taxidermy work with wonderful success. They save taxidermists' bills and enjoy their spare time as never before. Taxidermy is the most fascinating of all professions. *We can teach you to mount all kinds of game specimens* absolutely true to life, by the latest and best methods. Easily, quickly and perfectly learned, in your own home *during your spare time.* No need of leaving your present employment. You can decorate your home with Nature's best art; you can double your interest in sportsmanship. Let your gun and rod pay for your vacation.

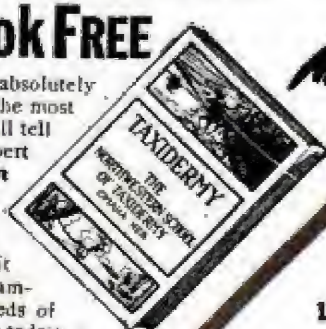
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We will send you this book on taxidermy absolutely free. It tells you all about our school and the most fascinating profession of Taxidermy. It will tell you how you can learn to become an expert taxidermist in a few months—*by mail—in your own home*—during your spare time. You need this book and it *costs you absolutely nothing.* Merely send in the *free coupon.* Write for it today—it is free—we will also send you the famous *Taxidermy Magazine* and hundreds of letters from our delighted graduates. Write today—*now—immediately—before you lay aside the paper.*

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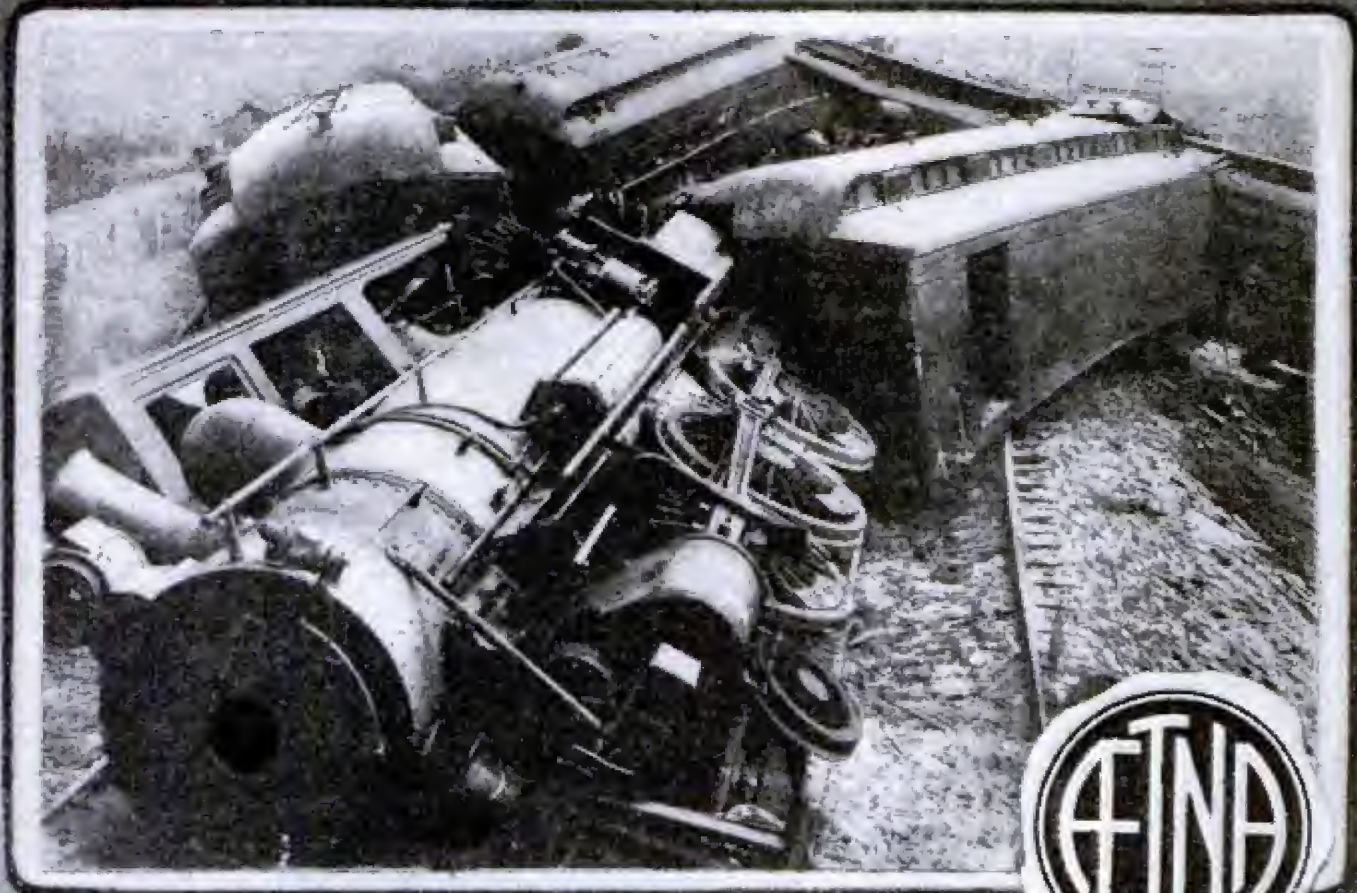
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To be **ÆTNA-IZED** is to be protected against accident by a policy in the **ÆTNA LIFE INSURANCE CO.** This famous and strong company writes life, accident, health and liability insurance in all forms, but it calls special attention to what it considers the most attractive insurance proposition on the market

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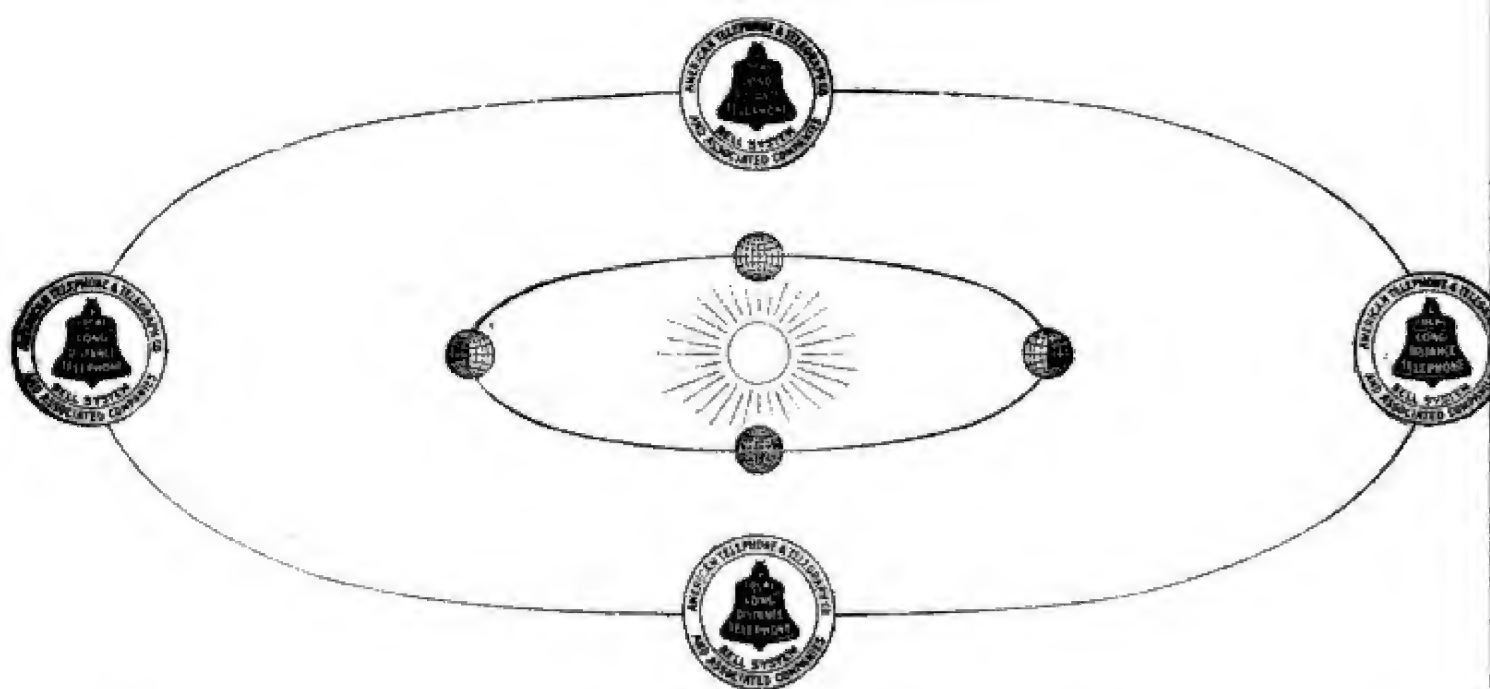
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Send me information about your \$10 COMBINATION POLICY

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Comparison of the Distance Traveled by Earth and Bell Telephone Messages

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In one year the earth on its orbit around the sun travels 584,000,000 miles; in the same time telephone messages travel 23,600,000,000 miles over the pathways provided by the Bell system. That means that the 7,175,000,000 Bell conversations cover a distance forty times that traveled by the earth.

When it is considered that each telephone connection includes replies as well as messages, the mileage of talk becomes even greater.

These aggregate distances, which exceed in their total the limits of the Solar system, are actually confined within the boundaries of the United States. They show the progress that has been made towards universal service and the intensive intercommunication between 90,000,000 people.

No such mileage of talk could be possible in such a limited area were it not that each telephone is the center of our universal system.

**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
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One Policy

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Universal Service

11 Tools in One



Save tools—save time—do all work easier, faster by having your tools always keen. Luther's Mechanics' Special Outfit supplies every sharpening, burnishing and polishing need, makes it the work of only a minute to do the toughest job of sharpening. The outfit consists of the Luther Mechanics' Special Carborundum Grinder with 11 accessories. This is the most complete sharpening, buffing and polishing outfit ever offered, and the most remarkable value.

6 Months' Free Trial

We offer you a whole half year's free trial of this full outfit to prove in your own shop, on your own tools, how this grinder saves and makes money for you—more than pays for itself in the time you use it free. If after a half year's use you do not firmly believe it is one of the greatest time-saving and work-saving outfits you have ever seen—if you do not believe it is a real money-maker for you, return it to us. No hard feelings on our part, and the six months' use will have cost you nothing. Return the coupon for our six months' free trial offer.

Carborundum wheels peel steel away in tiny shavings—no danger of drawing temper—no need of hard pressing—no need of cooling with water. The sharp Carborundum crystals cut toughest steel as emery does copper. Luther Grinders save and make money for any tool user—save money by saving time and tools, make money by making all work easier and faster because of keen, bright tools.

Luther Tool Grinders

are built like high grade lathes—steel and malleable construction, machine cut spur gears, bronze bearings in oil bath, etc. The machine lasts a life-time, and the wheels are guaranteed for 5 years and outlast any number of emery wheels in severest service. This outfit is a great economy for any tool user and we want you to prove it—FREE.

RETURN THIS COUPON

Return this coupon for our extraordinary half year's free trial offer on this entire Mechanic's Special Outfit, and for free booklet reprinting from McClure's Magazine the story of the discovery of the wonderful artificial diamond abrasive. Cut out the coupon now.

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Garage Men, Blacksmiths and Manufacturers

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STOP YOU

We know that "IF" you could see our lathes you would not hesitate in ordering from us, for they are practical in design, unexcelled in workmanship and, size for size, considerably heavier than other makes that will compare with ours in general design.

WHY HESITATE ANYWAY? Every lathe we sell is sent out with our guarantee: Your money back, including all freight charges, if you are not thoroughly satisfied. If the lathe is not what we claim it is, we want you to send it back. We have sold hundreds of lathes and not one has yet been returned. Every lathe sold adds one more satisfied customer to our list. We can satisfy you. **PRICES RANGE FROM \$60.00 UP.**



Write for our Machinery Catalog
"I." It tells you where to buy
the best machinery at the lowest
possible prices.

Address, SEARS, ROEBUCK AND CO., Chicago

Pay 17 Cents a Day and Own The Printype Oliver Typewriter

IMPORTANT: The introduction of the Printype Model came as the climax to our great advertising campaign in which we offered The Oliver Typewriter No. 5 on the 17-Cents-a-Day Purchase Plan. For months past we have devoted all our advertising announcements to the new Printype Oliver Typewriter, with its revolutionary improvement in typewriting type.

The impression has gained ground that the 17-Cents-a-Day Purchase Plan does not apply to the Printype Model. In some instances the idea prevails that we can even charge extra for The Oliver Typewriter equipped with Printype.

We desire to state with all possible emphasis that The Printype Oliver Typewriter can be purchased on the "17-Cents-a-Day" Plan at the regular price of \$100.

The Machine That "Typewrites Print!"

America rings with praise for The Printype Oliver Typewriter—the first writing machine that successfully TYPEWRITES PRINT!

This remarkable machine combines all the operative conveniences, all the practical improvements of the most highly perfected typewriter, with the type that from time immemorial has been used for magazines and books!

It is infinitely superior to the old style, thin outline Pica typewriter type—a fact which none will deny. It ranks in importance with *visible writing*, which the Oliver introduced.

The preference of typewriter buyers is so overwhelmingly in favor of Printype that *already over 70 per cent of our total output are "Printypes."*

The advantages of Printype are *self-evident*. The story is told at a *glance*.

Its beauty, its symmetry, its clearness and character, lend a new distinction to typewritten correspondence.

Printype Increases Speed

Not only does Printype enhance the artistic appearance of typewritten matter, but it enables the operator to attain greater speed, as the type is

so easy on the eyes. It relieves the tension on the nerves and thus gives wings to the fingers.

Printype —
OLIVER
Typewriter

The Standard Visible Writer

With all its commanding advantages from a purely mechanical standpoint, and its new artistic triumph, its supremacy is unquestioned. Its simplicity, versatility and extreme durability all revolve around the great basic feature—the *Oliver Double Type-Bar*.

Without this Double Type-Bar the successful use of Printype would be absolutely impossible.

"17-Cents-a-Day" Plan

This machine—The Printype Oliver Typewriter—offered on the famous "17-Cents-a-Day" Plan—has all the improvements, all the exclusive features which our experts have developed. It has the Vertical and Horizontal Line-Ruling Device, the Disappearing Indicator, the Back Spacer, the Tabulator, the Adjustable Paper Feed, the Double Release, the Automatic Spacer, the Locomotive Base and many other innovations which contribute to *high efficiency*. It operates with the lightest touch and, of course, *writes in sight*.

Why Don't You Write Us Today?

How can you resist the attractions of "Printype" and the appeal of the "Penny Plan?"

Here is the world's greatest writing machine—The Printype Oliver Typewriter—the standard visible writer—the regular \$100 machine—*actually offered for pennies!*

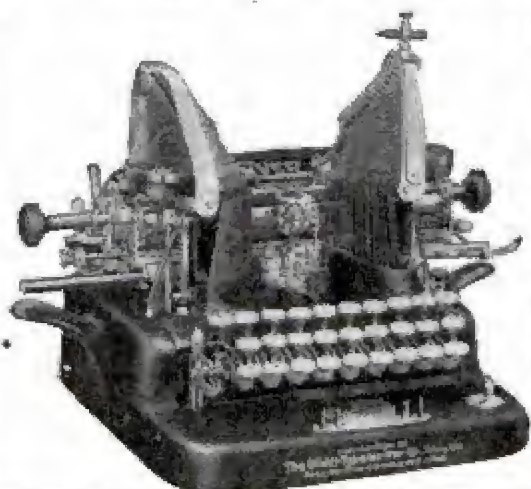
A small first payment brings The Printype Oliver Typewriter. Then you save 17 cents a day and pay monthly.

Your request will bring the special Printype Catalog, the details of the Penny Plan and a letter *written in Printype*. Whether you are "Commander-in-chief" of a business or a private in the ranks, you will be greatly interested in the literature we will send you. (128)

The Oliver Typewriter Company

794 Oliver Typewriter Bldg., CHICAGO

Agencies Everywhere



2c a Week Pays Wash Bill!

Write for
FREE Book

Electricity or Water-Power Does the Work

Just a "Twist of the Wrist" Starts or Stops the Machine!

The 1900 Motor Washers are now at work in thousands of homes. They are doing the work formerly done by women, at a cost of 2c a week for power! Saving thousands upon thousands of dollars in wash bills. Saving worlds of wash-day troubles. Leaving the women free to do other work while the machines are doing the washing.

The 1900 Motor Washer

Washes a Tubful in Six Minutes!

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Can be connected with
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Handles Heavy Blankets or Dainty Laces

The outfit consists of the famous 1900 Washer with either Electric Motor or Water Motor. You turn on the power as easily as you turn on the light, and back and forth goes the tub, washing the clothes for dear life. Then, turn a lever, and the washer does the wringing. All so simple and easy that it is mere child's play.

A Self-Working Wringer Free With Every Washer!

The motor runs Washer and Wringer. We guarantee the perfect working of both. No extra charge for Wringer, which is one of the best made. Write for FREE BOOK and 30 Days' FREE TRIAL OFFER! Don't doubt! Don't say it can't be done. The free book proves that it can. But we do not ask you to take our word for it. We offer to send a 1900 Motor Washer on absolute Free Trial for an entire month to any responsible person. Not a cent of security—nor a promise to buy. Just your word that you will give it a test. We even agree to pay the freight, and will take it back if it fails to do all we claim for it. A postal card with your name and address sent to us today will bring you the book free by return mail. All correspondence should be addressed to 1900 WASHER CO., 5024 Court St., Binghamton, N. Y. Or, if you live in Canada, Write to the Canadian Washer Co., 355 Yonge St., Toronto, Canada. (23)



Doing the wringing with
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By All Odds the most satisfactory lighting systems made are the
Yale "Arcolight" Pipe System
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"Yale Special" Hollow Wire System



Easy to install, easy to operate and approved by all insurance underwriters. Lights instantly. For stores, churches, homes. Gives a soft, brilliant light. 10 times that of electricity at $\frac{1}{4}$ the cost. Sold strictly on Merit and shipped complete ready to set up. Guaranteed 2 Years.

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TRIUMPH STAND LAMP

A 300 Candle Power Lamp for Home, Store, Shop, work bench, library, desk, or wherever a steady and powerful light is wanted or stand lamp can be used. Can be turned up and down like gas, and carried around with more safety than a kerosene lamp, and gives 10 times the light at less than $\frac{1}{4}$ the cost to operate, which a child can do. Better than gas or electric lamps because there is no hose or drop wire to prevent their being moved or used anywhere. Holds 2 quarts of gasoline, always ice cool, and one gallon lasts 40 to 50 hours. It has no competitor.

We have five other distinct lines of gasoline lamps, Hollow Wire Systems, and individual gravity lamps, unequaled by any other house. Every one a success and winner. Our POP Catalog tells all about them. Get it now and decide which line you want.

BRILLIANT GAS LAMP CO.

Dept. 1, No. 182 N. State Street, Chicago, Ill.



SOLID OAK EXTENSION DINING TABLE AND CHAIRS \$20.50

48 inch, Round Top, Pedestal Dining Table, extends to 72 inches, \$13.50. 4 Dining Chairs, \$7. 6 Dining Chairs, \$10

This sensational price is made possible by our original exclusive method of manufacturing in sections and shipping in a compact package which may be unpacked and the furniture made ready for use in thirty minutes.

Don't confuse this furniture with cheap furniture. We manufacture quality furniture only.

The oldest and largest firm
of its kind in the world



You do not risk one cent. Use the furniture for thirty days in your home. Prove our claim that you cannot duplicate it for double our price—then if you are not satisfied notify us and we will return all the money you have paid.

Free catalog full of similar bargains, giving full details, and a postal will bring it to you. Send for it today.

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Everything For the Home—On Credit

3862 bargains in home-furnishings are illustrated in our big fall catalog, hundreds of carpets and draperies in their natural colors. And this great book is free. We have a copy for you, send for it. Every housekeeper should have this wonderful book. Better send NOW for your copy.

Factory Prices

This catalog shows an endless variety of things that make the home more cheerful and comfortable. The largest city store does not show so many home conveniences—and on every article we guarantee an absolute saving of 15 to 50%. No other house—cash or credit—sells house furnishings at any where near our prices. We Ship Our Goods on 30 Days Approval, so you can return them if you find we have not made good on our claims. Our whole business is built upon special lots bought for spot cash from makers who are hard pressed, or from factories whose outputs we control. And we buy in enormous quantities. Factories compete with each other to sell us, thus we buy very close to actual cost.

Sent for \$1.25

No. AK387



Our Belle Oak Heater Burns any kind of fuel. Is splendidly nickel-plated, 43 inches high and has 10 inch firepot. Made of heavy gauged sheet steel and highly ornamented cast. One of the 112 stove bargains in our stove catalogue, and a guaranteed heater and fuel saver. Total price \$6.95.

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This beautifully finished Solid oak 42 inch top pedestal table finished in rich flaky grain of golden. Has hand carved legs. One of the specials of our bargain catalog. Only a limited lot to close out at this special saving price of \$10.95.

Only \$1.00 Monthly

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This elegant reversible Brussels Rug, woven of extra heavy, all-wool worsted yarns, is another example of the 3862 bargains in our big catalog. Comes in colors, green, red and tan, size 9X12 feet. \$18.00 value, our price only \$16.50.

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Furniture	Pianos	Washing Machines
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On \$10.00	On \$25.00	On \$50.00
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Pay \$1.00 Cash	Pay \$3.75 Cash	Pay \$7.50 Cash
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And no matter where you live or how much you earn, you can buy your home-furnishings here—on credit—without publicity—without red tape. We have trusted the great working class for over 27 years, and we know they are honest. Several hundred thousand people all over the country have open accounts with us. We give them over a year to pay for anything they buy while they use and enjoy the goods. You too, can have the same easy-to-pay terms on any of the 3862 things in our catalog.

30 Days Free Trial

Anything you select from our bargain catalog will be sent you for 30 days approval. You may use the goods a whole month before you decide to buy them. If they are not more than satisfactory—if we have not actually saved you 15 to 50% on your purchase—return the goods at our expense. We'll refund your small first payment—and even pay the freight charges both ways. Back of this offer is the endorsement of the First National Bank of Chicago.

4 Catalogs Free

Our New Fall General Catalog of 3862 bargains in home-furnishings should be in every home. Every housewife will appreciate its thousands of magnificent comforts.

Our 1911-1912 Stove Catalog shows 112 styles of Supreme stoves and ranges from 95c up. And any stove you select will pay for itself in the saving of fuel long before you have paid for it.

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Send for These Catalogs—They are All Free

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STRAUS & SCHRAM, Inc.,
Dept. 1028, 35th St., Chicago, Illinois

Gentlemen:—Please send me the catalog checked "X."

☐ General House ☐ Stoves & ☐ Ladies' ☐ Men's
Furnishings Ranges Clothing Clothing

Name.....

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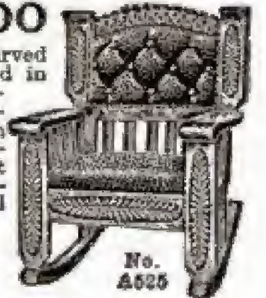
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15 to 50% Savings

Everything we sell is bought for spot cash at staggering reductions and sold at factory wholesale cash prices, on credit. When makers are caught with over-productions and surplus stocks—when they need ready cash, they come to us. We have more customers and buy in larger quantities than any other concern. So these makers cut their prices, to clear their factories—often selling practically at cost. Our entire Fall Catalog is made up of these phenomenal purchases. We Scoured the World's Markets to Get the 3862 Bargains This Wonderful Book Contains. And as no middlemen share in our prices we can absolutely guarantee a saving of 15 to 50% under any other prices. We invite you to make comparisons at our own expense.

Sent for \$1.00

Richly hand carved rocker finished in American Quarter Sawn Oak—upholstered in chase leather—offered here at a guaranteed saving of 25%. Total price \$5.25.



Only 50¢ Monthly

No. A525



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Sent for \$2.00

A magnificent solid oak book case finished in high gloss golden oak color. Has four adjustable shelves, bent glass door convenient desk compartment and drawers for storing papers, etc. One of our catalog features at this price \$11.70.

Only \$1.00 Monthly



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This complete outfit consisting of beamer angle steel bed in any color—spring support steel spring and cotton top mattress—bought from a factory whose output we control. A topnotch value at \$11.65.

Only \$1.00 Monthly

STRAUS & SCHRAM, Inc., Dept. 1028, 35th St., CHICAGO

Please Mention Popular Mechanics

ELGIN WATCHES ON CREDIT

Special This Month!

17-JEWEL GENUINE ELGIN \$16.50

IN A 20-YEAR GOLD FILLED CASE, only
Sent Prepaid on Free Trial at our Rock-Bottom Wholesale Price



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I want to send you a free copy of my latest book "Facts vs. Fables" or all about the Watch Business, both at home and abroad.

Let Us send you this beautiful Genuine 17-Jewel Elgin Watch, Complete in 20-year Gold Filled Case, Biggest Bargain Ever Offered!

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You Assume No Risk Whatever in Dealing With Us

because, before you buy or pay one cent we place the watch right in your own hands and let it do its own talking. We ask **NO SECURITY** and **NO INTEREST**—just plain honesty among men. Our Elgin Watches are so well known and our CREDIT PLAN so easy, that no matter where you live or how small your wages, **WE WILL TRUST YOU**, so that you and every honest man and woman can own a **DIAMOND** or High-Grade Elgin Watch in a beautiful Guaranteed 25-year Gold Filled Case and wear it while paying for it in such small payments that you never miss the money. Write Today for Our Big Free Watch and Jewelry Catalog.

It tells all about our easy credit plan and how we send Elgin 19-Jewel

B. W. Raymond and 21 and 23-Jewel Elgin Veritas everywhere on Free Trial, without security or one cent deposit, positively Guaranteed to Pass Any Railroad Inspection.

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The House That Sells More Elgin Watches Than Any Other Firm in the World.

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Price 50c each, or
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Why kill yourself by smoking a strong pipe? You can get a Scotch Calabash that absorbs all nicotine and poisons and ensures a cool, sweet smoke. Money back if you are not satisfied.

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The value of salt meadows was not realized until aviators found them the most suitable portions of the earth's crust to fall upon. They are Nature's springs and hair mattresses for weary bird men.—Brooklyn Eagle.

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GOODS FOR EVERYBODY. World's headquarters for Dynamos, Motors, Fans, Toys, Railways, Batteries, Belts, Bells, Pocket Lamps, Telephones, House Lighting Plants, Books. If it's electric we have it. Undersell all. Fortune for agents. Big Catalogue 4 cents.

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WONDER LAMP

The United Factories of 617 Wyandotte St., Kansas City, Mo., is making an offer to send a \$6 lamp free, **FREE** express prepaid, to one person in each locality in the U. S. who will show and recommend this marvelous incandescent 100 candle power oil lamp. Simply send name and address for their offer.

MAKE \$10.00 A DAY WITH THIS \$5.50 TAKE QUICK MACHINE

which takes and finishes in one minute a square or button picture in a Postal Card or Brooch which costs you less than one cent and sells from 10 to 15 cents each. No dark room. No Experience Necessary. The best money getter wherever crowds assemble. Fairs, Carnivals, Conventions, etc. Be your own boss, a small investment starts you in business. Write for FREE catalog describing our Machines.

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Compare the Prices on COME-PACKT See the Big Saving!

Put the prices of Come-Packt Sectional Furniture side by side with the lowest cash figures of the best stores. You will find you save **over half** buying from our factory. We make and guarantee every piece absolutely. Quarter Sawn White Oak used throughout. Shipped completely stained and finished, in sections. Your choice of eight finishes.

\$90.75 Dining Room Suite for \$42.50

No.	Dealers' Price	Come-Packt Price
413, Buffet (Copper Trimmings)	\$40.00	\$17.75
337, Extension Dining Table (3 Leaves)	34.75	14.75
104, Four Dining Chairs	16.00	10.00

Which price do you pay, \$90.75 or \$42.50?

Any of the above sold separately at these figures.

Big Six Catalog Mailed Free. Six money saving departments—Mission and Bungalow furniture (200 pieces) new Willo-Weave Furniture, Mission Lamps, Cluny Lace Curtains, etc. Write Today.

COME-PACKT FURNITURE CO., 1001 Edwin Street, Ann Arbor, Mich.



Where Fortune Seekers Win

100 New Towns and Cities in Western Canada are Clamoring for Men Like You

Write for Big Free Book, "A Chain of Opportunities in Grand Trunk Pacific Towns"

In 1913, the last spike will be driven on the Grand Trunk Pacific, Canada's ocean-to-ocean transcontinental railway that has opened new worlds of opportunity for men of push and pluck.

The main line from Winnipeg to the Rocky Mountains is already completed, with a network of branch lines tapping vast areas of the finest wheat land in the world. The provinces of Manitoba, Saskatchewan and Alberta, which for the past few years have been the scene of the most marvelous colonization movement in all history, have filled up so rapidly with farmers that the present era of town-building is to meet existing demand for market facilities. On the Grand Trunk Pacific main and branch lines are more than a hundred new towns, in various stages of development, with more than

YESTERDAY

TO DAY

TO MORROW

10,000 Business Openings

In a multitude of different lines. These hundred rapidly growing towns are calling for men. They offer splendid rewards for labor of hand or brain. Fortunes are being won in advancing values of real estate, in profits on business enterprises. Artisans, laborers—all who are willing to work—command the highest wages. Everybody has money. Prosperity is in the air. Opportunity is everywhere. The sound of the saw and hammer echoes throughout the land. The tremendous activity in town-building typifies the spirit of Western Canada—the spirit of Achievement, shown in the resistless sweep of civilization, conquering the Last Best West.

A New Empire in the Making

Here is a vast new country, fabulously rich in resources, teeming with opportunities, where every man can generously share in the fruits of Empire-building.

Such chances will never come again. Such chances will not wait. Even now, as you read this announcement, thousands are on the way and thousands are ready to start. This very hour you should decide to answer this, the Last Call of the Last West.

How \$2,000 Grew to \$235,000 in 6 Years

John W. Phillips arrived in Western Canada in 1903 with \$2,000. Today he pays taxes on \$235,000 worth of real estate holdings. He simply seized opportunities. Canada did the rest. One man makes \$18,000 to \$32,000 a year from a general store. Incomes of \$5,000 to \$10,000 and \$15,000 a year are common.

Mirror—the Magic City

The town of Mirror, named in honor of the famous newspaper, the London Daily Mirror, is a typical example of town-building in Western Canada. No more striking illustration of the condition of this great section can be given than the following fact: One day in the month of July at a sale of lots in Mirror, all records were broken, 577 lots being sold in 660 minutes, bringing the enormous sum of \$251,648. That's nearly a lot a minute! \$2,075.00 was paid for one corner lot. Canada's keenest business men were among the buyers.

The town of Mirror already has two banks, two stores, two lumber yards, hotel, restaurant and a newspaper.

Mirror is located on the Edmonton and Calgary line of the Grand Trunk Pacific Railway and is surrounded by one of the richest agricultural sections of Alberta. Towns of today are cities of tomorrow.

Send for the Great Book

"A Chain of Opportunities in Grand Trunk Pacific Towns," FREE

It will quicken your pulse beat to read the astounding fact-stories of success which men in your own circumstances have achieved in Western Canada. Send a postal or letter at once. *Get in early!* Let the Coupon be the Hand of Fortune that will lead you to the great opportunity land.

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G. U. RYLEY, Land Commissioner

Room 304, Union Station, Winnipeg, Canada

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(Give name of profession, business or trade.)

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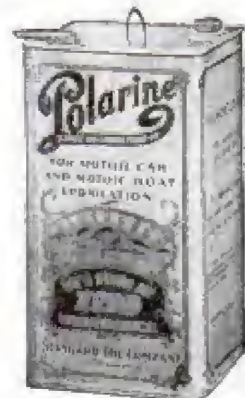
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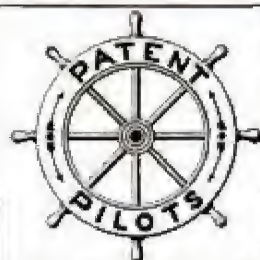
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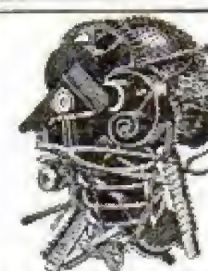


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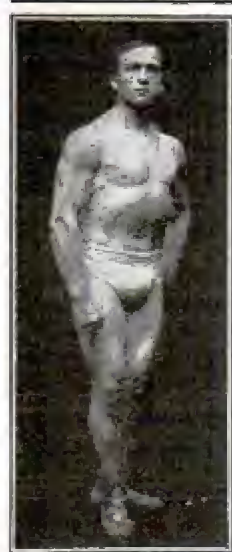
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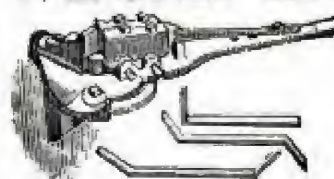
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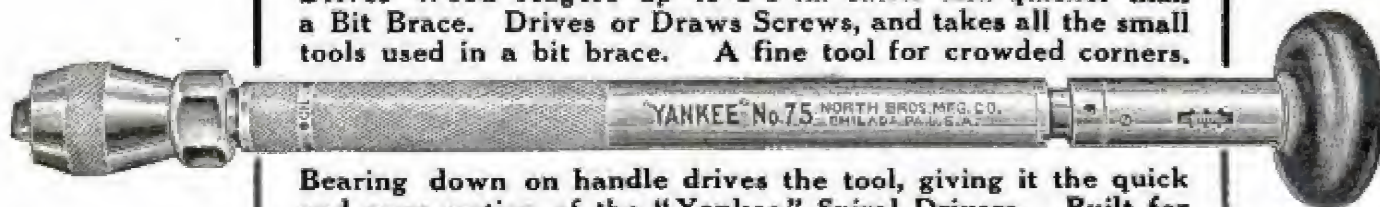


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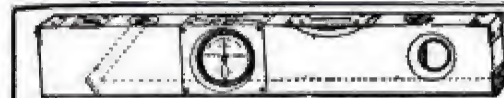
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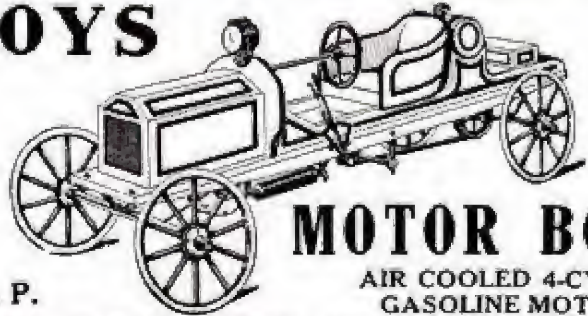


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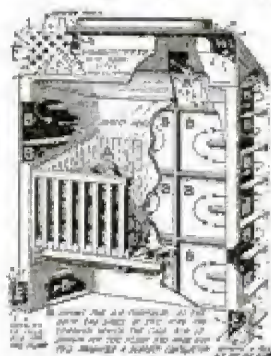


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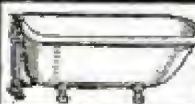
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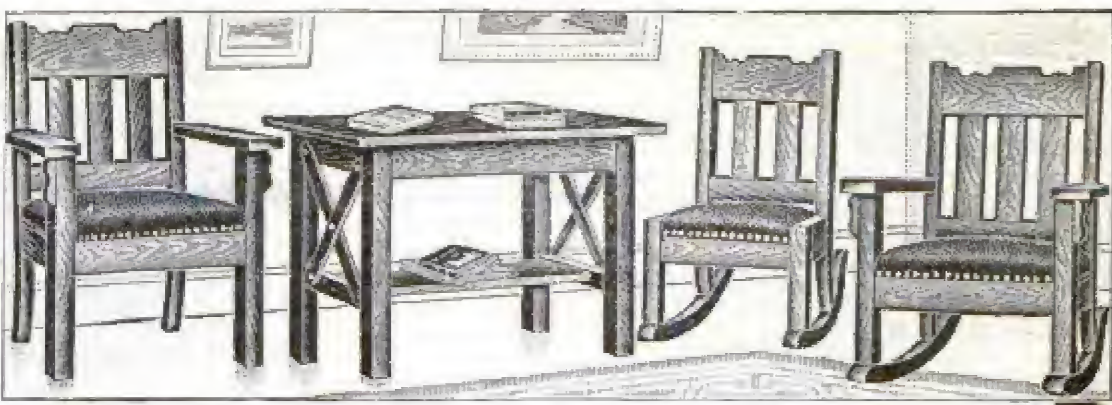
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\$1.50 brings you this entire mission set—the rich, massive library table, the two elegant comfort rockers and the big, handsome arm chair. These elegant pieces are all made of best selected solid oak in the popular weathered oak finish. Seats of rockers and chair are heavily padded and upholstered in high-grade Imperial leather. A beautiful set that you will be proud to show.

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It's as Easy as A-B-C to Add \$5 to \$60 a Week to Your Income

This is just the opportunity you have been looking for. I have shown hundreds of readers of Popular Mechanics how to increase their income. **Here are the facts** that should appeal to you.

- 1 You can grow mushrooms anywhere. In your barn, shed, or any outbuilding. One of the best places in the world is your basement.
- 2 Mushroom growing does not take any time from your present occupation, as they require almost no care at all.
- 3 Success is certain with my method and the demand will always be far in excess of the supply.
- 4 Almost no "capital" is required. Many successful growers have started with \$2 worth of spawn.
- 5 My instructions are so plain and easy to follow that anyone who can read English is sure of success.

Women succeed in mushroom business as well as men. Mrs. Mary Bonar, Ohio, writes: "I know a woman can raise mushrooms successfully, for I have tried it and succeeded." Mrs. Guillaume, Wis., says: "Can sell all I have at 80 cents per pound." Boys find a sure enough "gold mine" in mushrooms. Herbert Fickenworth, 12 years old, Chicago, writes: "I am picking and selling mushrooms every day." Webster Jones, aged 14 years, Little Rock, Ark., says: "Any boy who is willing to follow directions can learn to grow mushrooms." "Growing mushrooms is just the kind of work a boy likes, and I know I can make more money out of it than anything else."

How Some Bank Accounts are Growing

Just read these extracts from letters such as I am receiving every day:

I have a customer in California who started a few years ago with a few small beds, and this year is putting \$10,000 in the business.

Another customer in Massachusetts also started in a very small way and this year is putting in \$60,000. (Names upon request.)

My youngest grower is 10 years old and he is meeting with splendid success. I have any number of letters from people who started with an investment of \$2 and find that they can easily net from \$50 to \$60 on the one spawn.

Every State Agricultural School in the United States has my book of instructions as a reference book. One of the biggest crops that I ever heard of has been grown at one of the Experimental Stations by my method of growing and with my spawn.

Two of my customers in Arlington Heights, Ill., in the basements of their homes last year, invested \$75 in the mushroom business and raised \$680 worth of mushrooms, leaving a clear profit of \$605 on an investment of \$75.

I Will Tell You the Facts About This Business

The fact that you have read these statements and have learned a few facts concerning the money making possibilities of mushroom growing, will never benefit you one penny's worth if you don't take advantage of the chance it affords you, and GET POSTED.

I am the largest grower in America and have had 14 years' experience. I have put the facts about this great business into a book which I call, "How to Make Money in Mushrooms." Now the first thing for you to do is to either write, or send the coupon for this book. IT IS FREE. And when I send the book I will also give you very complete information as to the best way for you to start, the cost, etc., etc. Then you can think it over and make up your mind. But send for the book anyhow. DO THAT MUCH TODAY.

Please mail me your book "HOW TO MAKE MONEY IN MUSHROOMS," and also give me full information as to the best way to start, cost, etc. All this to be entirely without cost or obligation on my part.

P. M.
A. V.
Jackson,
Jackson Mushroom
Farm
6248 N. Western Ave.
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APPROVAL**

**NO
MONEY
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Take this
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30 DAYS FREE

If you don't want to buy it, simply send it back at our expense. You will owe us nothing and will not be out a cent, as we pay the freight both ways. But if you want to keep it, you may make your own terms—you can have it for about one-third the price agents ask for this very machine, and you can take $2\frac{1}{2}$ years to pay if you want to.

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means if the machine proves defective in material or workmanship during 20 years of service we will replace it or refund your money. Our half-million dollar factory stands back of this guarantee.

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Strictly ball bearing; has the newest drop head automatic lift; is easy running and sews a perfect lock-stitch. Among the operations it performs are Adjustable Hemming, Hemming and Sewing on Lace, the French Seam, Frilling, Tucking, Binding, the French Fold, Braiding, Darning, Quilting, Ruffling, Plaiting, Ruffling between two bands, Edge Stitching and Piping and Shirring. We positively guarantee that this marvelous variety and perfection of work cannot be duplicated by the attachments of any other family sewing machine in the world. The machine is complete and includes all the attachments. Try it 30 days FREE. Then if you wish to keep it make your own terms. Write to-day for our free 64-page illustrated catalogue and full particulars of the most liberal sewing machine offer ever made.

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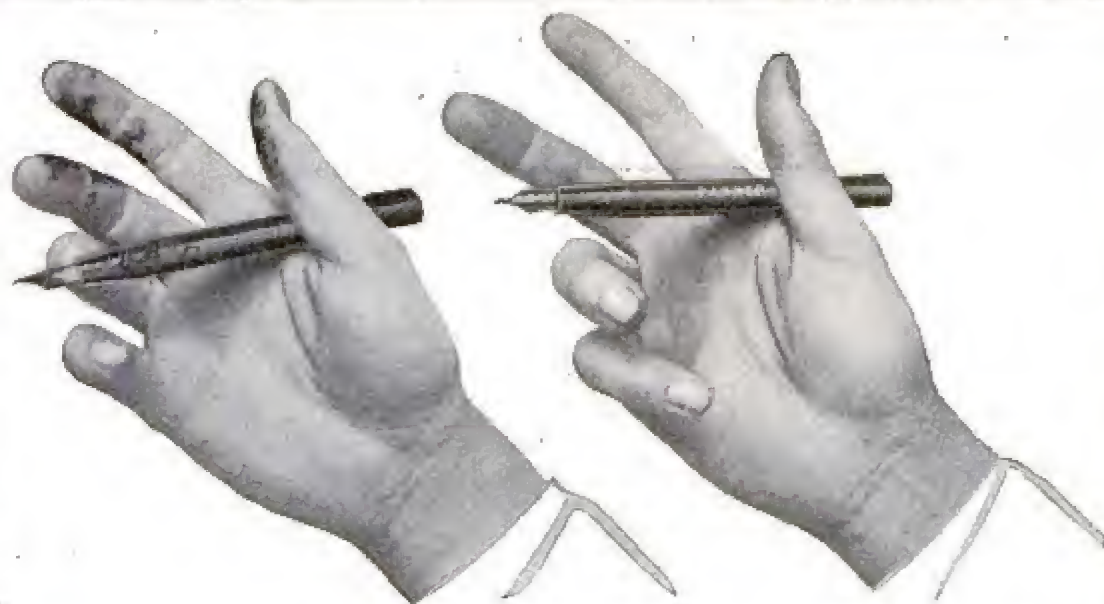
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Please Mention Popular Mechanics



Finger Smearing Abolished by this New Invention

WHEN you put an ordinary fountain pen in your pocket, you think all the ink settles in the bottom. Most of it does, but some ink still stays at the top in the straight tube which feeds the pen point.

The space between the bottom ink and the top ink is full of air.

When this air gets warm from the heat of your body, it begins to expand. Like expanding steam this air pushes out where it can. So it pushes out through the feed tube and pushes the ink out ahead of it, smearing ink over the writing end of the pen.

Until George S. Parker, of Janesville, Wisconsin, invented the "Lucky Curve," no fountain pen manufacturer was able to abolish finger smearing.

Mr. Parker simply curved the back end of the feed tube over against the wall of the fountain pen barrel. The touching of the end of the curved tube against the wall causes a quick and powerful suction which draws all the ink out of the feed tube down into the reservoir below, every time you place your Parker in your pocket. Thus the expanding air finds no ink to push out.

The "Lucky Curve" suction is created by capillary attraction, that wonderful trait of nature which causes a flower stem to suck water, or a lamp wick to draw oil.

There's never a hitch or skip in flow of ink from a Parker Pen. Made plain, or with gold or silver mounting. Standard style Parker Lucky Curve Pens, \$1.50 to \$250.00, according to size, style and ornamentation. Self-Filling and Safety styles, \$2.50 and upwards. The only pocket clip that recedes out of the way, when you slip cap off to write.

Get a Parker Fountain Pen today before you forget it. If it isn't satisfactory, return it and get your money refunded. Don't hesitate to return it. We protect dealer by contract.

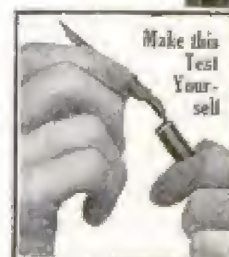
If dealer doesn't keep them, send us his name, and we'll send you our artistically printed catalogue and fill your order direct.

The Parker Pen Co., 100 Mill Street, Janesville, Wis.

New York Retail Store, 11 Park Row, opposite the Post Office



Style 51
Price \$3.50



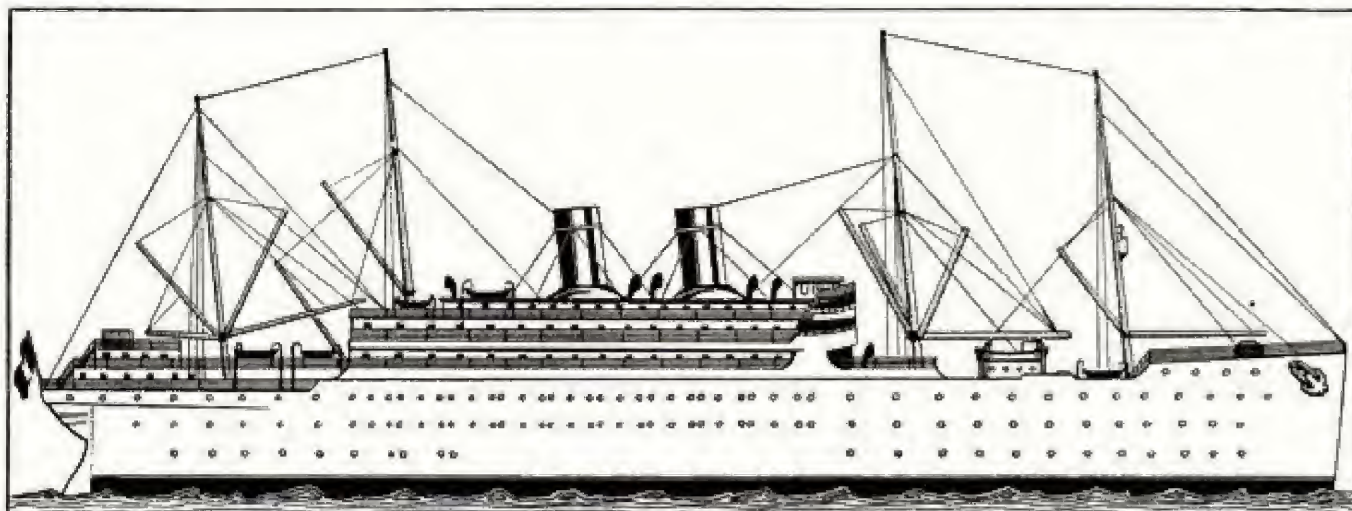
Fill Parker feed tube with ink; touch curved end to barrel wall, as in test picture. Watch the ink scoot down, proving thereby that the Parker Pen will not leak.

PARKER LUCKY CURVE FOUNTAIN PEN

50c
EACH

Lithographic Models

50c
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Steamship

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**Automobile
Gas Engine
Dynamo**

Price **50c** Each
Set of seven, \$3.00
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**Steam Engine
Wireless Telegraph
Steam Turbine**

THESE models are of great value as a means of graphically showing all the interrelated parts of the above named mechanisms by virtue of their construction, which is similar to that of educational manikins of the human body and organs, with which nearly everyone is familiar. Beginning with the outermost or surface parts of the gas engine, for example, these are all differently colored and numbered to correspond to a printed key of names which comes with each model. By means of their hinge-like attachment, they may then be lifted, thereby disclosing to view the layer of parts next underneath, exactly as they would be in the engine itself, and so on until the innermost construction is shown.

Size 8x14 inches

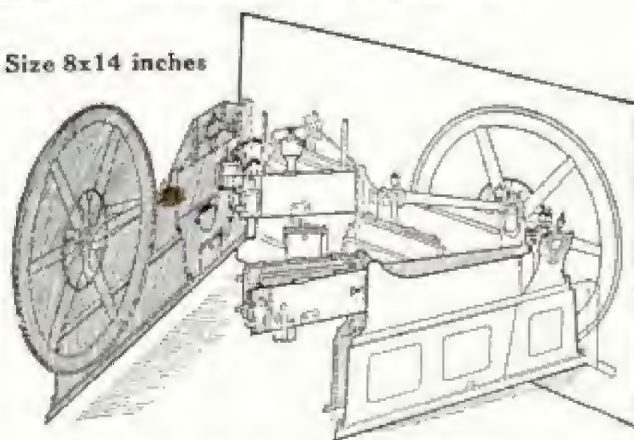
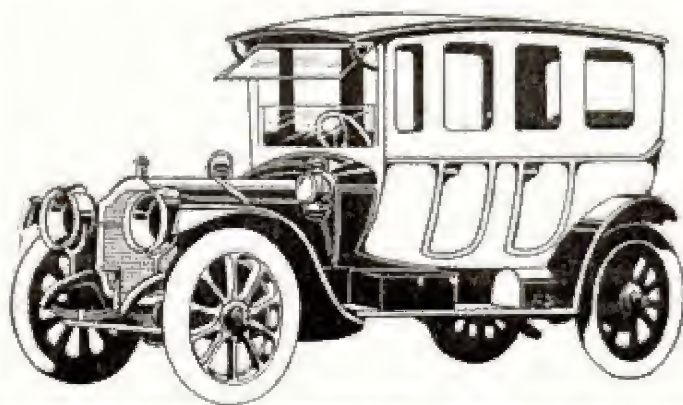


Illustration shows how parts separate



THE use of these models is without a doubt the most practical method of familiarizing one's self with these wonderful machines. In fact, one can learn the construction and working principles better with the models than with the actual machines because with the former every inside part can be seen and studied—something impossible with the real thing itself unless it be taken entirely apart.

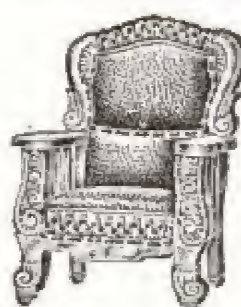
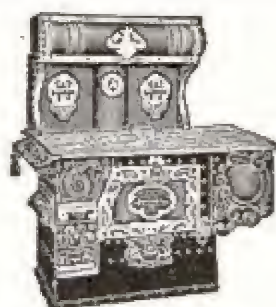
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So on with 3,000 beautiful things. Every price that we quote will amaze you.

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Ask us to mail this book. If you see something you want in it, have it sent on approval. Keep it a month before deciding to buy. If you wish to return it, we'll pay freight both ways.

Any furnishings you keep will be charged to your

account. You can pay as convenient—a little each month. On a \$5 article pay 1½ cents per day. On the average purchase we allow a year to pay.

We ask for no mortgage, no form of security. There is no interest, no publicity, no red tape. There is no extra price. We simply ship the goods on an open account. We have done this for 46 years. We have accounts now with over one million people. If you want such an account you have simply to ask it. We gladly trust people who buy things for their homes.

New Bargain Book

Our greatest Bargain Book has just come from the presses. It shows the thousands of things which we picked up in midsummer—in the duldest summer known in years. It will show you what sacrifice factories made to get rid of surplus stocks. Every page shows beautiful things at the lowest prices ever quoted.

You should see this book, for there is nothing else like it. The book is entirely free. Simply cut out this coupon, fill it out and mail it to us today. The mammoth book will then be mailed at once. Act now, else you may forget it. (153)

3,029 Bargains **On Credit**

**Furniture
Carpets
Rugs
Draperies
Stoves
Lamps**

**Silverware
Chinaware
Washing Machines
Sewing Machines
Kitchen Cabinets
Baby Cabs, etc.**

Our Bargain Book is enormous—pages 11x17 inches. The pictures are big, and many are in actual colors. The pictures shown here are simply small reproductions.

SPIEGEL, MAY, STERN CO.

1647 35th St., Chicago

☐ Mail me new Bargain Book.

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Spiegel, May, Stern Co., 1647 35th St., Chicago

Railroad Men Wanted Quick **\$80 to \$185 a Month**



Write for our legal binding bond to place graduates in position sure if 20 to 35 years of age and mentally and physically O. K. We can quickly fit you for a big paying position no matter where you live, in your spare time at home. Learn from practical Railroad men. This is the school endorsed by R. R. Managers. Write now.

OFFICIAL RY. SCHOOL, Gen. Office 500, Freeport, Ill.

\$18 to \$30 a Week Sure

Farmers "Ever Ready" Tool Kit does it

Agents going wild over results M. Snyder made \$46 in 2 hours Joseph Pine took 65 orders in 2 days. M. D. Finch sold 42 in 9 hours. Had no experience. You can do it. To show it means a sale. **FREE SAMPLE** to workers.

FOOTE MANUFACTURING CO., Dept. 260, Dayton, O.

10 TOOLS

IN ONE





The smoothest thing in life
is "Velvet."



"Velvet"—one splendid pipe tobacco, so-called because of its unusual smoothness. It's Burley leaf—"special selection"—that's some! Two years of aging—hanging while time mellowed it—and the harshness, the bite, disappeared—goodness was left—Velvet. Velvet can be smoked all day and won't disagree—good taste—fine fragrance. Make a special trip to the ship—Velvet. 10c at all dealers.

Velvet should be on every dealer's shelf—IF OUT, send us too, for the regular tin—sent only in United States.

SPAULDING & MERRICK
Chicago, Ill.

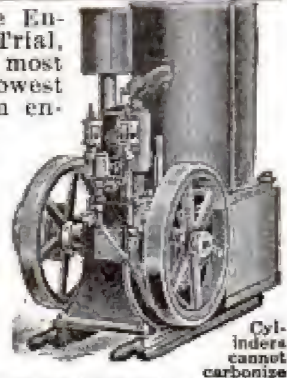


Use KEROSENE Engine FREE!

Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing.

Gasoline Going Up!

Automobile owners are burning up so much gasoline that the world's supply is running short. Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline. No waste, no evaporation, no explosion from coal oil.



Cylinders cannot carbonize

Amazing "DETROIT"

The "DETROIT" is the **only** engine that handles **coal oil** successfully; uses alcohol, gasoline and benzine, too. Starts without cranking. Basic patent—only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h.p., in stock ready to ship. Complete engine tested just before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric-lighting plant. Prices (shipped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate amazing, money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, we will allow you Special Extra-Low Introductory price. Write!

DETROIT ENGINE WORKS, 213 Bellevue Ave., DETROIT, MICH.

1½ H.P. Kerosene or Gasoline Engine \$49.50

4 and 6 h. p. sizes at proportionate prices. Runs farm machinery, pumps, separators, saws, water systems, electric light outfits, etc. Very simple. A woman or boy can operate it. Uses little fuel. Absolutely guaranteed. Write for catalog and 30 day trial offer.

GRAY MOTOR CO.

1032 U. S. Motors Bldg., Detroit, Mich.



GOFF'S Prize Winning Model Aeroplanes

Best and Go Farthest

Our RED WING model is the speediest Flyer made. One customer writes: "Your RED WING model 'B' is a remarkable Flyer, its maneuvering in a wind being wonderful." Our machines are not mere toys, but are built on scientific lines of the finest material and workmanship. Large, powerful motor and propeller, made to stand rough usage. Size of machine 16 in. wide by 18 in. long, no parts to put together, every machine guaranteed to fly 125 feet. (Simple directions sent with each outfit as well as a blue print 18 1/2" x 26 1/2" of Blériot Monoplane FREE.) Sent by prepaid express on receipt of \$1.00.

WRITE FOR CATALOG

Goff Aeroplane Co., 219 S. Dearborn St., Chicago

Ann Arbor "INSTANTO"



GASOLINE
LIGHTING
SYSTEMS

Change from a 150 candlepower light to 2 candlepower in a jiffy. This latest and most perfect development of the gasoline lamp found only in Ann Arbor Lighting Systems. It gives the country home a lighting system as perfect, handsome and modern as city gas. Ann Arbor Lighting Systems are brighter than gas, steadier and clearer than electric light, and cost about one-tenth as much to operate. Each lamp gives 150 to 500 candlepower for less than 1/2 cent per hour. Fuel is gasoline; perfectly safe.

We make Complete Lighting Systems for Homes, Churches, Stores, Etc. Prices, \$10 up, according to number of lamps desired.

We Want Agents who will push our line. A splendid opportunity right now for hustling agents in large cities to sell to owners of summer cottages, country homes and resorts. No other light can equal it in brilliancy, beauty of fixtures and economy. Sells on sight. Catalog and prices on request.

SUPERIOR MANUFACTURING COMPANY, 294 Second St., ANN ARBOR, MICH.

THE WIZARD LIGHT



**THE INSTANTANEOUS SYSTEM
REQUIRES NO GENERATION
WHEN YOU WANT LIGHT
JUST PULL THE CHAIN**

**WIZARD
FOUR MANTLE ARC**

**THE "QUICKLIT"
No 30
LIGHTS WITH A MATCH
AS CONVENIENT AS CITY GAS**

THESE latest inventions represent the acme of perfection in artificial lighting. After once installed the instantaneous system requires no generation and can be operated as conveniently as electricity at one-tenth the cost.

The Quicklit Systems are operated as conveniently as city gas, as lamps are lit with an ordinary match.

All our lighting systems represent the highest standard of quality and are fully guaranteed. They are so simple that any one can operate same.

For further particulars and exclusive agency address

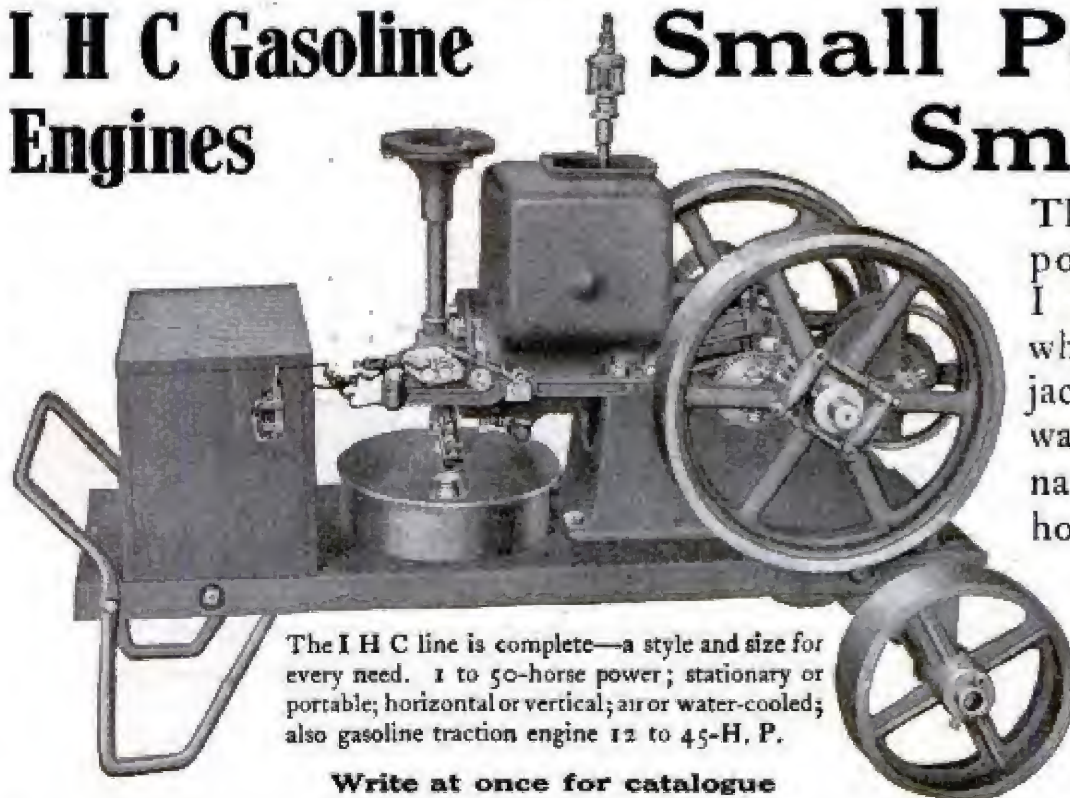
THE NAGEL-CHASE MFG. CO., 153 West Ohio St., Chicago, Ill.



TABLE LAMP

I H C Gasoline Engines

Small Power at Small Cost



The I H C line is complete—a style and size for every need. 1 to 50-horse power; stationary or portable; horizontal or vertical; air or water-cooled; also gasoline traction engine 12 to 45-H. P.

Write at once for catalogue

This famous one-horse power, hopper-cooled I H C gasoline engine when belted to a pump jack will supply all the water needed on an ordinary suburban country home, or farm. It will also operate the cream separator, grindstone, bone cutter, saw, washing machine, etc. And in the shop, it operates the lathe,

drill, presses, emery wheels, grinders, and other small machines. This little worker is surprisingly powerful for its size and operates at very small cost. Equipped with governor, etc., same as our large engine. Wait till you get all the facts about I H C gasoline engines before you decide. Address

International Harvester Company of America

(Incorporated)

16 Harvester Building

Chicago U S A

\$10.00 AND UP

FLOOR your new home or re-floor your old one with hardwood at \$10 and up per room, by the Colonial Method and save from \$15 to \$20 per room.

Colonial HARD WOOD Floors

are of best, standard quality Oak and Satin Walnut, steam kiln dried to prevent shrinking and accurately milled. Used over old floors or in new buildings, they add tone to any property and dollars to its selling or renting value. Simple, sanitary and ornamental. Colonial Hardwood Floors represent the least cost of re-furnishing rooms, and beautiful rugs cannot be properly displayed without them.

Simple and Economical

Installation simple and maintenance economical. Old floors or other woodwork need not be removed. An ordinary carpenter or anyone handy with tools can do the work. Suitable designs for irregularly shaped rooms furnished free.

Materials sold FREIGHT PREPAID; safe delivery guaranteed; money refunded if not satisfactory.

Write today for free samples of material and descriptive booklet, all sent prepaid.

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Snappy, Stylish Suit To Your \$12.00 Measure



A suit that your tailor would ask \$25 or \$30 for. We deal direct with the consumer—no middlemen's profit to pay. You can wear tailor-made garments at less than ready-made prices. We make you a stylish, perfect fitting, better wearing suit than you can possibly buy from your local tailor or dealer, **and save you money.**

We make suits and overcoats to order for \$12 to \$24 and prepay express.

We Send You Our Style Book and Samples Free

Make your selection from our Style Book, which contains cloth samples of the latest weaves and designs for fall and winter wear, also fashion plates showing the swellest, classiest, snappiest styles ever created. It is absolutely free. Send for it today.

There is positively **no chance for a mistake** with our simple, yet perfect, system of home measurement.

Remember, we aim to please every customer. We have been making honest tailored clothes at rock-bottom prices for the last 15 years. The Illinois Trust and Savings Bank of Chicago will tell you that we are responsible.

MADISON TAILORS

250 Central Union Block - Chicago, Ill.

FOR SALE One each—one, two, and four cylinder 4 1/2 x 5

SHEFFIELD MARINE FOUR CYCLE ENGINES

Never been used. At a sacrifice for immediate sale.

FULL DESCRIPTION ON REQUEST

E. H. ALLEN, 3620 Michigan Ave., Chicago, Ill.



Front View

ARE YOU ROUND SHOULDERED?

"Nulife" straightens and squares your shoulders instantly. It compels you to stand, sit and walk correctly. Makes you breathe properly at all times. Expands your chest from one to three inches. Reduces your abdomen to the proper proportions. Fills out the hollows around the neck, strengthens the back and supports the spine; gives the person who wears it a commanding appearance. "Nulife" is worn by men, women and children. It is sold throughout the United States and Canada at \$3.00. For a limited time I will send "Nulife" to the readers of POPULAR MECHANICS MAGAZINE for \$2.00 postpaid. When ordering send your proper height, weight and chest measurement. Illustrated booklet on "Nulife" sent free upon request.

PROF. ANTHONY BARKER, 649 Barker Bldg., 110 W. 42nd St., New York, N. Y.



Back View

BEACON LAMP BURNER FREE



Incandescent, 100 Candle Power. Burns common coal oil. Gives better light than gas, electricity or six ordinary lamps at one-sixth to one-tenth the cost. Fits your old lamp. Unequaled for fine sewing or reading.

COSTS ONLY ONE CENT FOR SIX HOURS

We want one person in each locality to whom we can refer new customers. Take advantage of our special offer to secure a Beacon Burner FREE. Write today. Agents Wanted. **HOME SUPPLY CO.**
248 E. C. Life Bldg., Kansas City, Mo.



Health

"Fat, oil, butter, cream and eggs certainly caused my catarrh and deafness, but your diet of lean meats, green vegetables, fruits, etc. cured me in a few weeks. My brain power and complexion improved tremendously, and I succeeded financially."

Different classes of foods cause different diseases, but correct combinations cure.

Send ten cents for instructive booklets: (1) The Brainy Diet Cure, (2) Diet vs. Drugs, (3) Effects of Foods, (4) Key to Longevity.

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we're going to give away a complete course in physical culture, personally prepared by Mr. Macfadden, to every person sending us \$1.00 for an eight months' subscription.

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MAKES A PHONOGRAPH SOUND LIFE-LIKE

eliminates that unpleasant metallic effect which is more or less common to all phonographs, regardless of price. Can be attached in a minute by anyone and lasts as long as the machine. Thoroughly tested and proven successful.

Mailed Prepaid upon Receipt of Price, \$1.00. Guaranteed Absolutely Satisfactory or Money Refunded.

In ordering please state whether for Victor, Victor-Victrola, Edison with rubber or metal connection, Columbia Disc or Columbia Cylinder.

Information and circular matter free.

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450 Lumber Exchange, Minneapolis, Minn.



THE Morse Clarifier is a remarkable little device made to fit in tube between reproducer and horn of phonographs. It renders the sound loud, clear and life-like and

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FAMOUS MICHIGAN SPEED WHEELS REVERSE GEARS & MARINE HARDWARE

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Send for our large catalog of valuable information on speed wheels, reverse gears and marine hardware. Everything new and up-to-date.

Prices Right. Satisfaction Guaranteed

We carry an immense stock and can make you prompt shipments and save you money. Send for our free catalog today.

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Solar Motorcycle Lamps

are the neatest looking, strongest and most efficient lamps made. The product of light specialists, makers of 90% of the automobile lamps used on the high grade cars of America. Catalog shows many styles — gas, oil and electric. Write for it today.

BADGER BRASS MFG. CO.

Kenosha, Wis. New York City, N. Y.

WINDOW TRIMMING

Advertising and Card Writing are the best paid professions in the world. Interesting prospectus FREE tells you all about it.

KOESTER SCHOOL, 306 Jackson Boulevard, CHICAGO

BE AN ELECTRIC METERMAN

Hundreds of new positions created yearly. Instruments and Meters are used wherever Electricity is used. Trained men must maintain them.

Metermen Earn \$900-\$1800 a Year

Our Course will fit you for a position. Practical—easy to learn—recommended by leading electrical men.

Write to-day for free booklet—learn how we assist our graduates.

FORT WAYNE CORRESPONDENCE SCHOOL
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DIAMONDS ON CREDIT

This Diamond Ring is our great special. Only the finest quality pure white diamonds, perfect in cut and full of fiery brilliancy are used. Each diamond is skillfully mounted in our famous Loftis "Perfection" 6-prong ring mounting, which possesses every line of delicate grace and beauty.

L-1220—Specially selected fine brilliant white Diamond **\$25** \$5 down, \$2.50 a month

"PERFECTION" DIAMOND RINGS

L-1221—Specially selected brilliant white Diamond **\$50** \$10 down, \$5 a month.

L-1223—Specially selected brilliant white Diamond **\$100** \$20 down, \$10 a month.

The three rings here shown are the most popular, although we show all sizes in our large, handsome Catalog. Each ring is solid 14 karat gold, and is cased in a dark blue velvet ring box with white satin lining.

An Ideal Gift

Ask us to send you a Ring on approval. It will be sent at once, all charges prepaid. If you are not perfectly satisfied, return it at our expense.

Write for our Free Catalog containing over 3,000 illustrations of Diamonds, Watches, Jewelry, Silverware, etc. It tells all about our easy credit plan. Write today.

LOFTIS BROS. & CO., Diamond Cutters,
Dept. E 894, 100 to 108 N. State St., CHICAGO, ILL.
Branch Stores: Pittsburg, Pa., and St. Louis, Mo.

ALL-METAL SELF-CLEANSING

Electric Washer

And WRINGER Complete for

\$65

Positive Drive—No Springs to break. Will wash any washable fabric clean, quickly at trifling cost. Will save its cost in 8 months in wear and tear of clothes alone, to say nothing of time, money and hard work. We will ship to you direct anywhere in the United States. A year's guarantee goes with every Washer sold.



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**OUR
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Men 20 to 40 Years Old Wanted at Once for Electric Railway Motormen and Conductors

Our mail course will prepare you for Motorman or Conductor in four to six weeks, and we will immediately assist you to a good paying position. You will be independent; your services will be in demand; good Motormen and Conductors are needed everywhere. We place men on city and interurban lines in all parts of the country, and want men in every state.

RIGHT NOW IS YOUR OPPORTUNITY!

Fill in the coupon, cut it out and send it at once for our Free Book, "Great Opportunities in Electric Railway Work."

NATIONAL RAILWAY TRAINING ASSOCIATION
Suite 7, Dwight Building Kansas City, Mo.

Name..... P.O..... State..... Age.....

WIN THIS \$1200!

Thousands Already Won—Going on Daily
TEN PEOPLE GET \$40,000

They Tell You How to Win

LISTEN! Stoneman (Nebr., photographer) actually received \$1200 one month, \$51.50 in 15 minutes, \$800 in 11 days; Korstad (Minn., solicitor) \$2212 in 2 weeks; Sevegne (N. Y., telegrapher) \$100 daily. Not a fairy tale, fake or humbug, but proven absolutely true by sworn statements, Government patronage, statesmen, judges, bankers, world's famed institutions, local references. Costs nothing to investigate. This gigantic money-making contest no longer controlled by a few—now open to any honest industrious man or woman. Big money made by mechanics, clerks, farmers, teachers, doctors, lawyers, people from all walks of life. Experience, capital, business training unnecessary. You can own, operate and control same private enterprise that brought Wilson (banker) \$3,000 in 30 days; Rasp (agent) \$1685 in 73 days; Oviatt (minister) \$4,000; Rogers (surveyor) \$2600; Juell (clerk) \$6800; Hoard (doctor) \$2200; Hart (farmer) \$5000; Schleicher (minister) \$195 first 12 hours. Hundreds sharing similar prosperity—banking money, buying homes, automobiles. Don't wonder. Same appointment should mean same money for you—same power, prominence, dignity, respect, influence. Rise to big earnings, wage freedom, ownership, and private monopoly. Knowing the reason dispels all doubt. Wonderful, but true. Strange invention gives every home a bath room for only \$6.50; excels others costing \$200. Abolishes tubs, bowls, buckets, wash rags, sponges. Turns any room into a bath room with hot or cold running water. Think of it! So energizes water, one gallon ample; cleanses almost automatically; no plumbing; no water-works; self-heating. Gives cleansing, friction, massage and shower baths. So simple child can operate. Truly marvelous. A modern home-bathing without drudgery, inconvenience, mess of lugging water, filling tubs, emptying, cleaning, putting away. Could anything be more popular? Think of millions who want bathrooms! At sight people exclaim: "There, there, that's what I've been longing for." Little wonder Wilson sold 102 in 14 days; Hart, 16 in 3 hours. Think what you could do. Come—fall in line—make a fortune. Don't let another get there first. Your chance now to secure exclusive sale. Devote all or spare time. Means phenomenal earnings; no competition; fascinating, high-grade business.



M. Stoneman



M. Juell



"SEE IT
ENERGIZE"

ALLEN MFG. CO., 3382 Allen Building, TOLEDO, OHIO

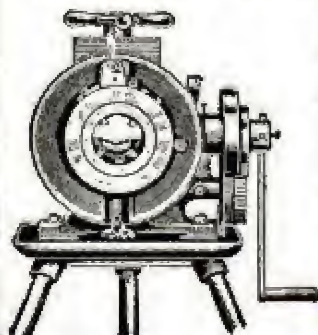
Best Turkish Bath At Home 2c



Just flush out the three million pores in your body with the "Robinson" Thermal Bath. It takes only 15 minutes. Costs only two cents. Relieves La Grippe, Bad Colds, Rheumatism, Dyspepsia, Skin Diseases. Our Big \$2 Book Free for a few days only.

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4 Inch Hand Machine



Combined Cutting and Threading Pipe Machine complete with Vise and Stand.

Get Price and Catalog

THE OSTER MFG. CO.

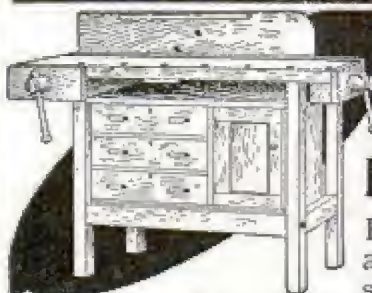
2100 East 61st St., CLEVELAND, OHIO

Sandow \$37⁵⁰ 2½ H. P. Stationary Engine—Complete

Gives ample power for all farm uses. Only three moving parts—no cams, no gears, no valves—can't get out of order. Perfect governor—ideal cooling system. Uses kerosene (coal oil), gasoline, alcohol, distillate or gas. Sold on 15 days' trial. **YOUR MONEY BACK IF YOU ARE NOT SATISFIED.**

5 year ironclad guarantee. Sizes 2½ to 20 H. P., at proportionate prices, in stock, ready to ship. Postal brings full particulars free. Write for proposition on first engine in your locality. (116)

DETROIT MOTOR CAR SUPPLY CO., 2 Canton Av.,



Only \$14.50

For this Home Bench

Besides its convenience and usefulness, you will save its price in a year

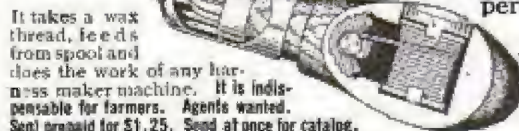
by doing repair work and "fixing things" that you now pay a carpenter or repair man to do. Thousands of homes have home benches we have furnished—why not you?

Top is 50 in. long, 20 in. wide, with a 13-inch glued-up portion of thick maple

Grand Rapids Hand Screw Co.
620 N. Front St. GRAND RAPIDS, MICH.

FOR MENDING HARNESS

shoes, tents, awnings, pulley belts, carpets, saddles, suit cases, buggy tops, dash boards, or any heavy material. Stewart's Automatic Awl is the only perfect Sewing Awl.



It takes a wax thread, feeds from spool and does the work of any harness maker machine. It is indispensable for farmers. Agents wanted. Sent prepaid for \$1.25. Send at once for catalog.

STEWART-SKINNER CO.
26 Hermon Street
Worcester, Mass.

3 BEAUTY POSES 25c.

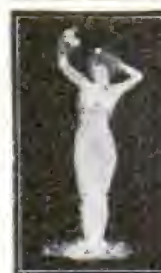
Decorate your "Den" with "Art Gems"

Exquisite portrayals of female loveliness. 3 bewitching poses 25c; 6 for 50c. One 6½x8½ photograph free with every order for six.

Our Dollar Special: Two 6½x8½ photographs, 6 cabinet size and 32 small photos, all for \$1.

Our pictures are all real photographs. No reproductions of paintings or other cheap trash. Money back if not pleased.

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NO MORE BALD HEADS



When our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who

know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials, and booklet on "HAIR," sent sealed in plain envelope, FREE.

THE MODERN VACUUM CAP CO.

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CONGRESS CARDS

For Social Play - Art Backs - Exquisite Colors - High Quality.
New Designs - Club Indexes - Ideal for Bridge.
Gold Edges - Air-Cushion or Ivory Finish.

OFFICIAL RULES OF CARD GAMES - HOYLE UP-TO-DATE
ISSUED YEARLY - SENT FOR 15 CENTS IN STAMPS.
THE U. S. PLAYING CARD CO., CINCINNATI, U.S.A.

BICYCLE CARDS

In Use Throughout the World for General Play
The Most Durable 25 Cent Card Made.
Club Indexes - Air-Cushion or Ivory Finish.



The Little Friend of the Deaf

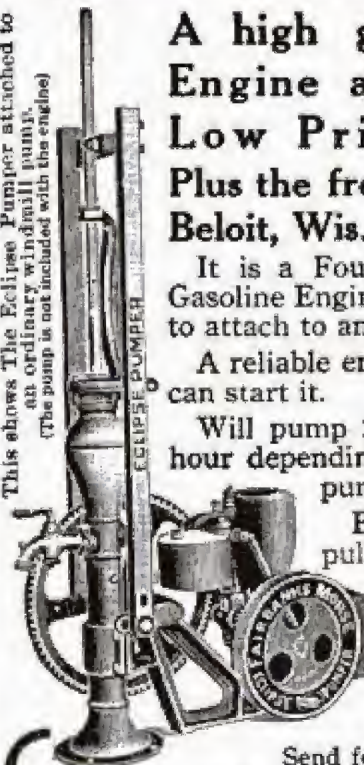


Actual
Size

This ad is to deaf people who have about given up—who are failing in hope and in courage—people who think their cases unlike other cases which have been relieved. We don't want any money. Just send for a book that tells about "Wireless Telephones for the Ears"—little devices that 390,000 deaf people are using today because they HEAR with them. Think of it, men and women; these tiny wonders are so small that they fit in the ears out of sight and so soft that you never feel them, even when lying down! Yet you hear whispers! Is your case beyond such simplicity? Not a bit of it. One of the officers of this company is a deaf man. He became desperate, and in desperation developed this marvelous ear drum. It is one of the inventions of Mother Necessity—an inspiration. Talk to him today. You'd never even suspect his affliction. He's been improving this tiny "phone" for 20 years. There is nothing else to compare with it—anywhere. Don't you want the book he has written about it—a book by a man who understands deaf people because he is one of them? You do, if you want to improve your hearing. Just say, "Send the book," on a post card, and mail it to WILSON EAR DRUM CO., 144 Todd Bldg., Louisville, Ky. (17)

Fairbanks-Morse Eclipse Pumper

This shows The Eclipse Pumper attached to an ordinary windmill pump. (The pump is not included with the engine)



A high grade Pumping Engine at the \$50.00 Low Price of

Plus the freight from factory, Beloit, Wis. Buy One Now

It is a Four Cycle Water Cooled Gasoline Engine and Pump Jack ready to attach to any pump.

A reliable engine, so simple a child can start it.

Will pump 200 to 2000 gallons per hour depending on size and type of pump and lift.

Engine has two belt pulleys at different speeds for driving cream separator, churn, grind stone, etc.

Catalog shows how to attach to other pumps and farm machines.

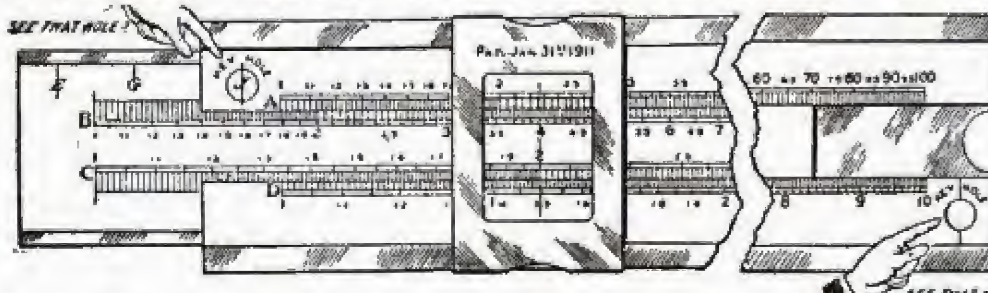
Send for Free Catalog No. MZ 449.

Fairbanks, Morse & Co.

Wabash Ave. and Eldredge Place

Chicago

Let the Slide Rule Do Your Work—Do Your Work



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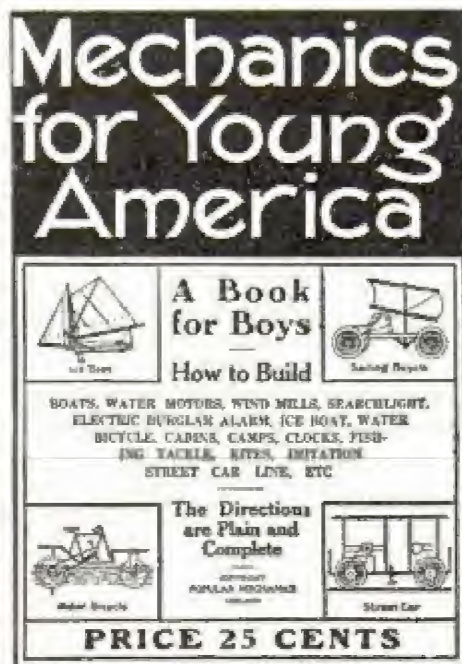
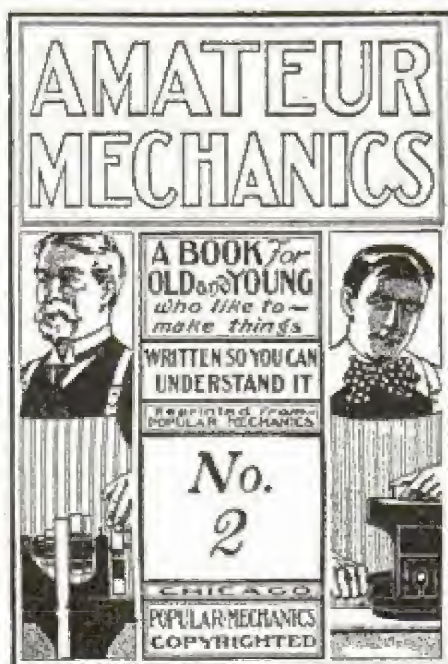
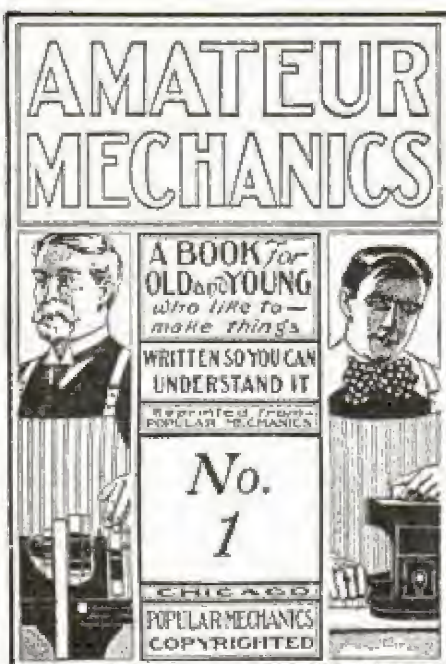
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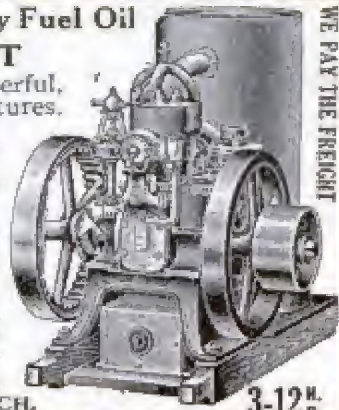
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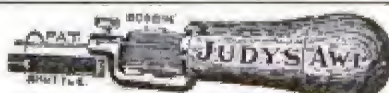
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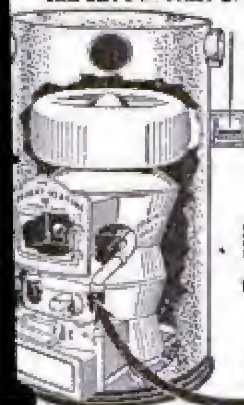
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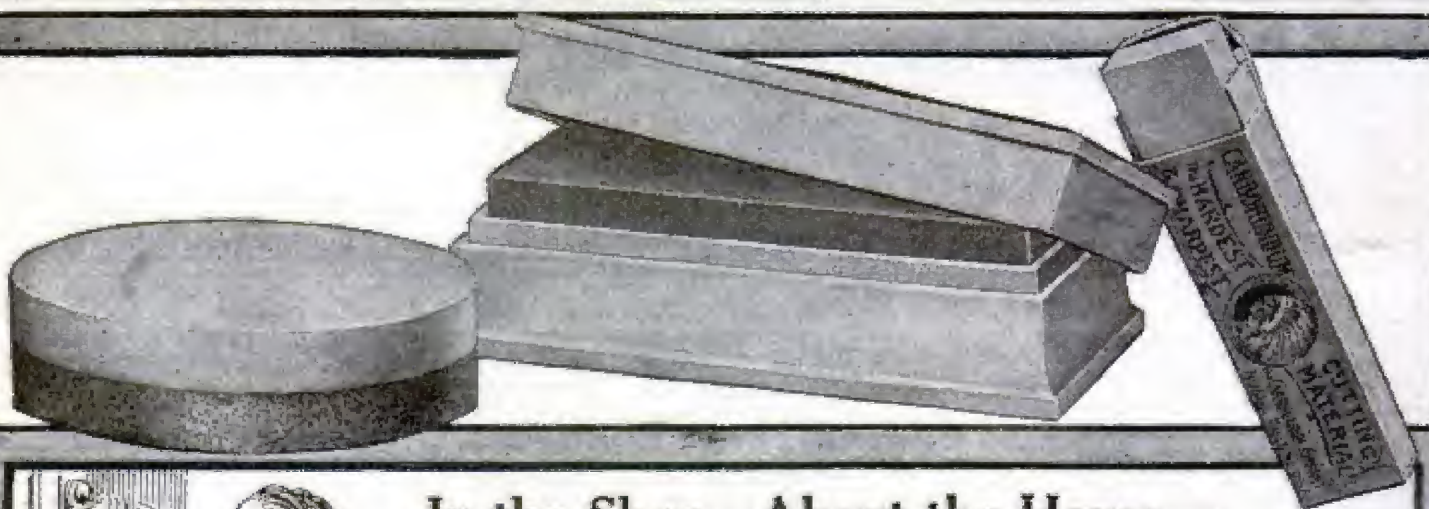
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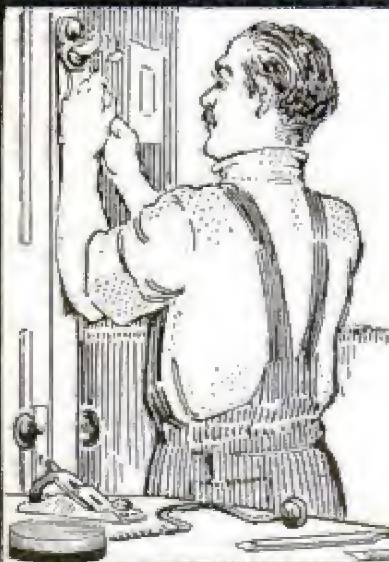


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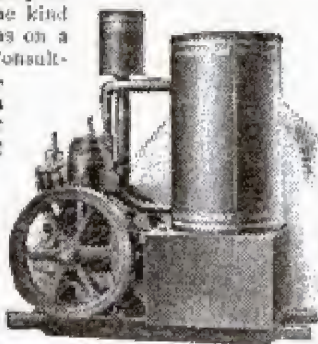
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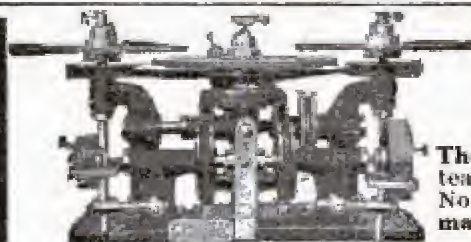
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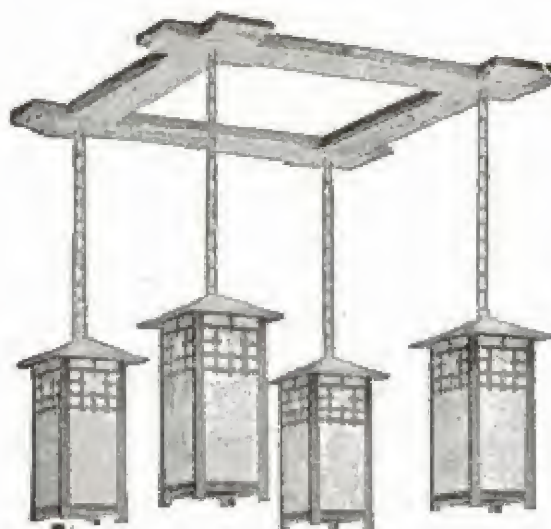
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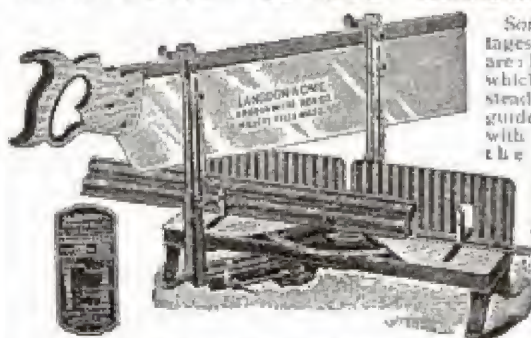


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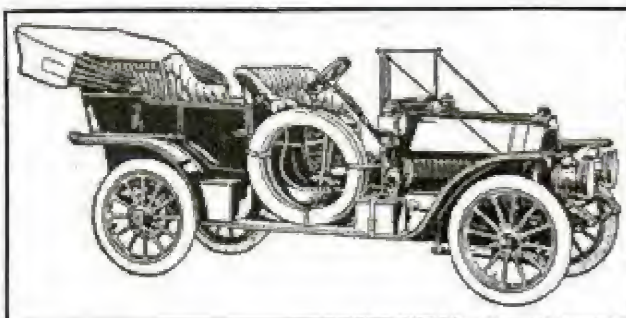
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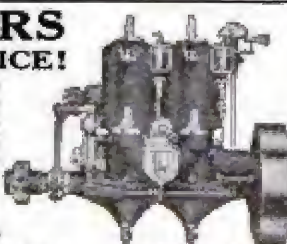
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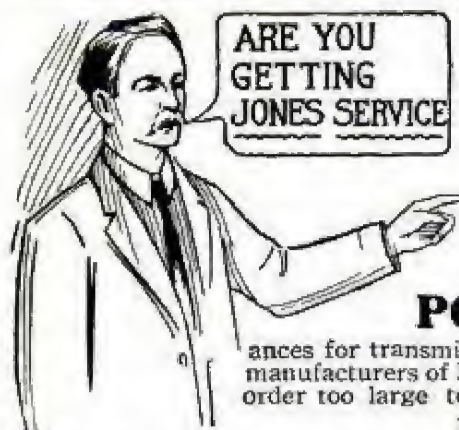
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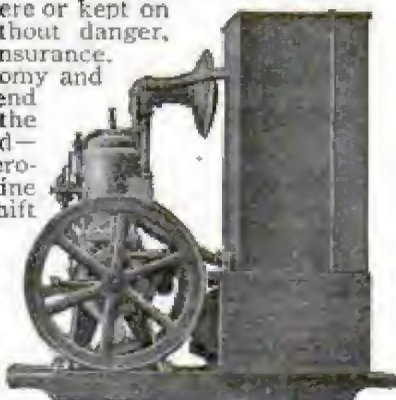
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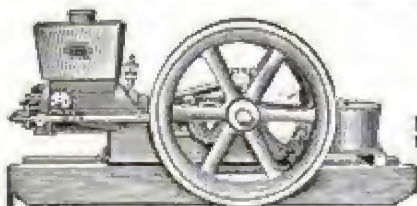
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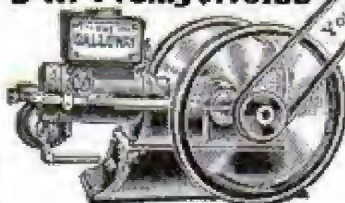
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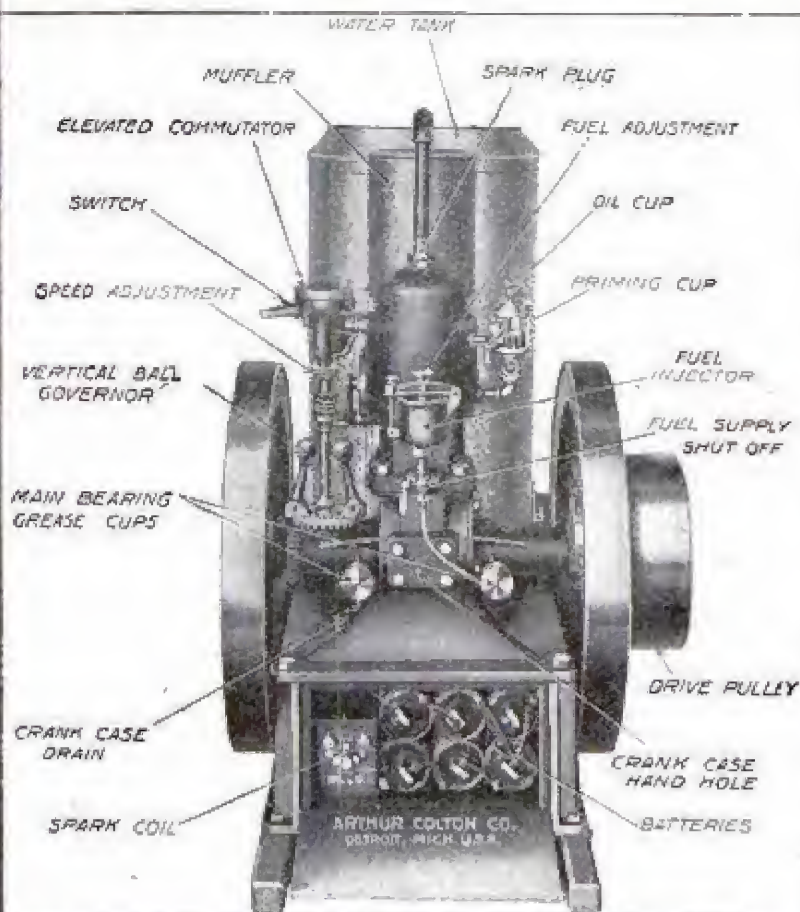


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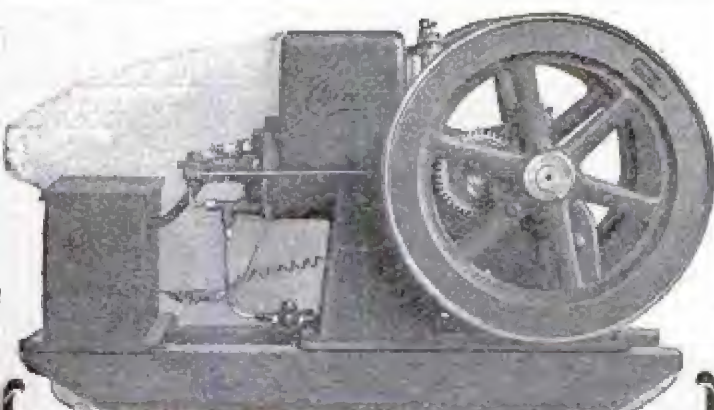
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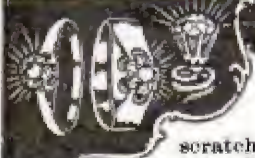
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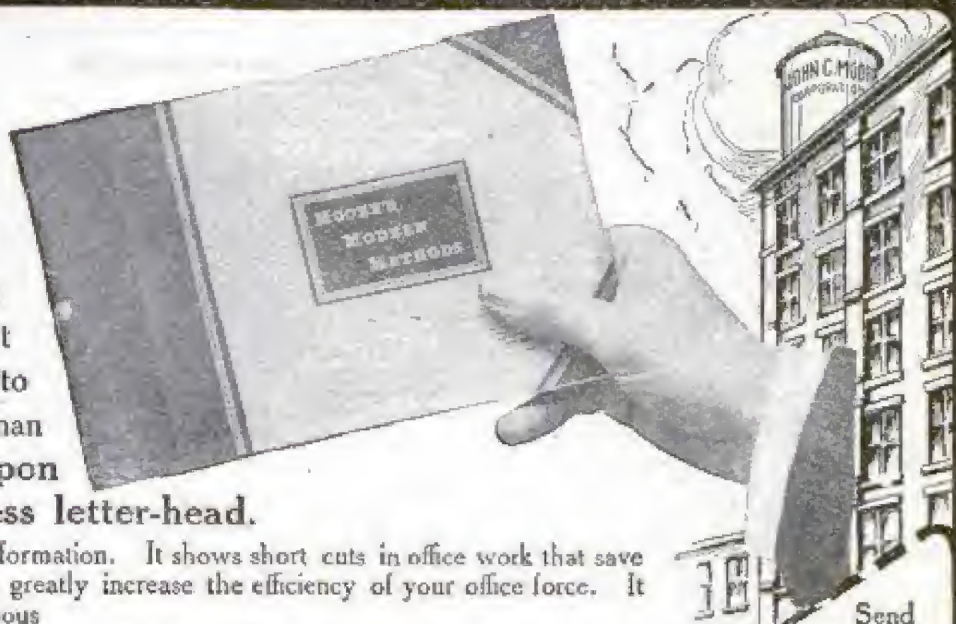
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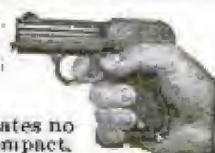
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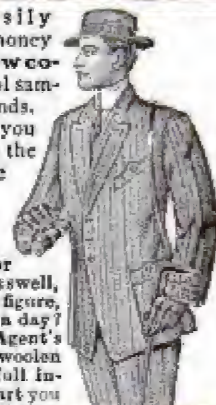
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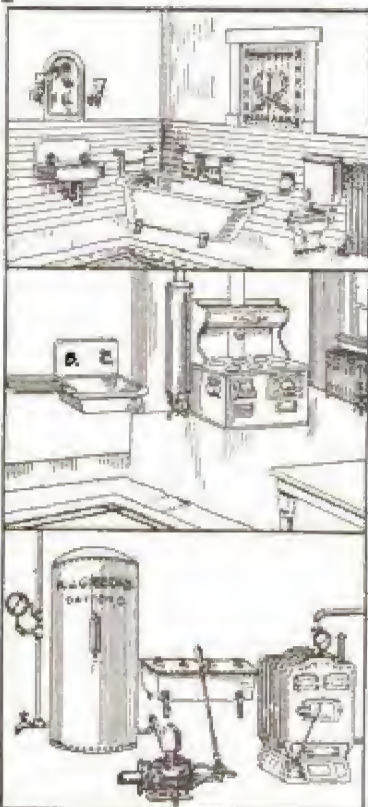
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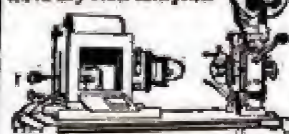
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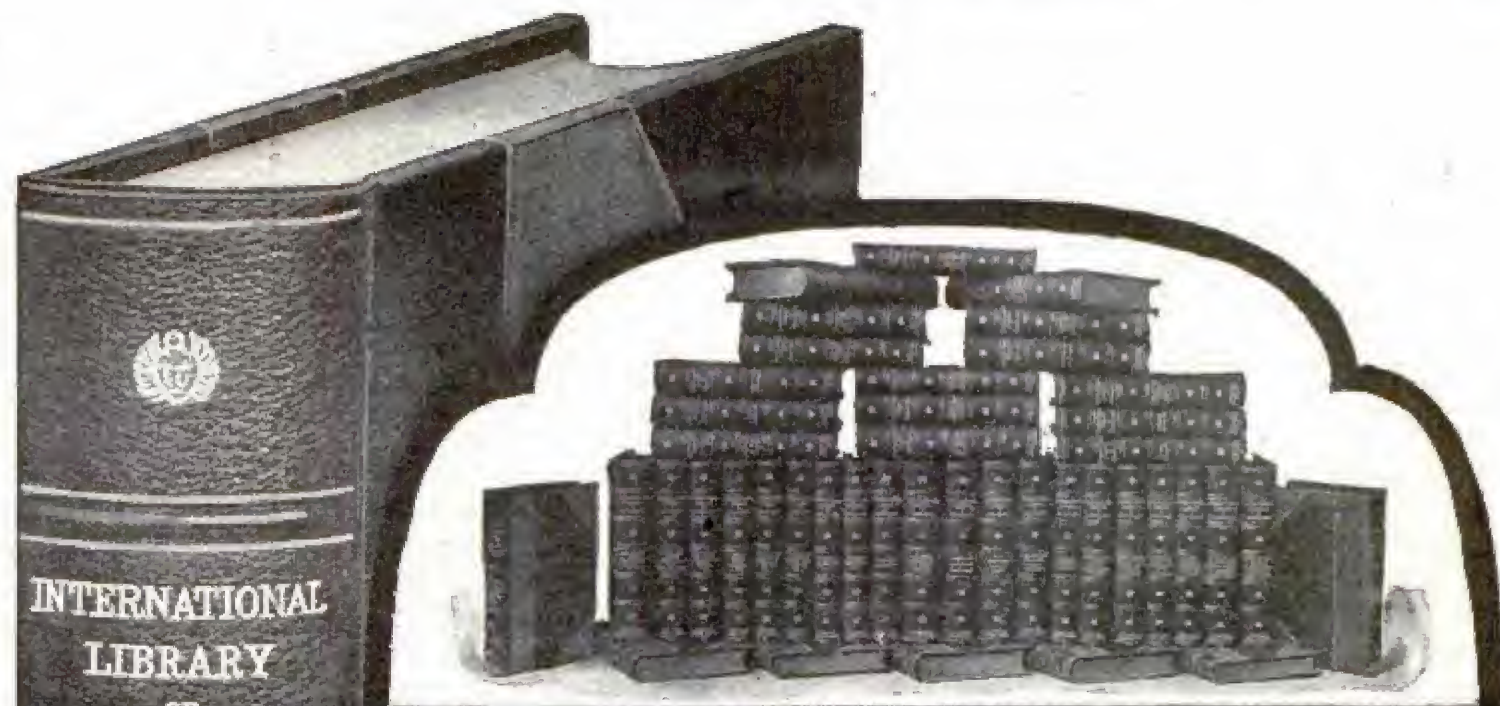


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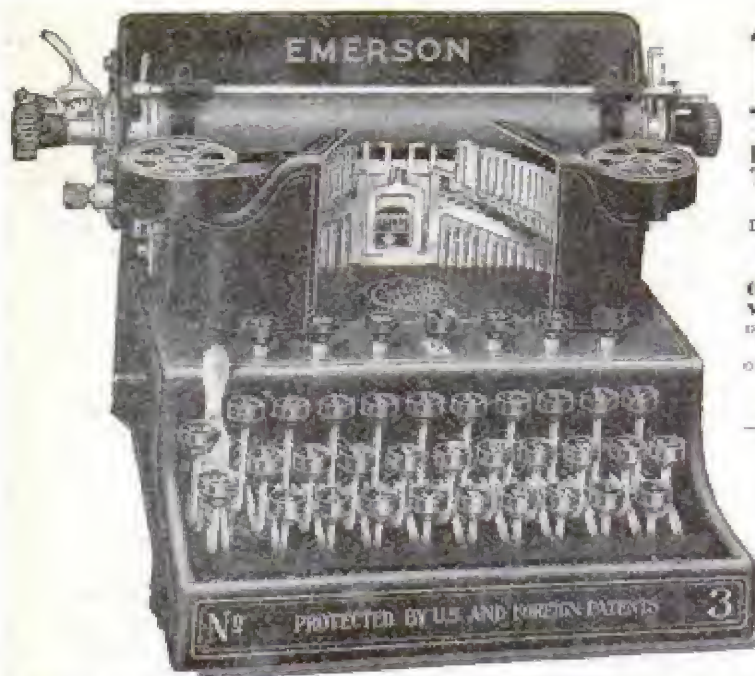
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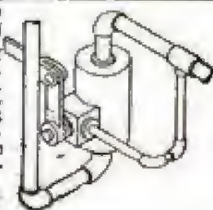
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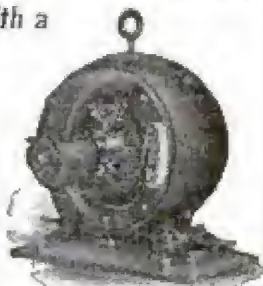
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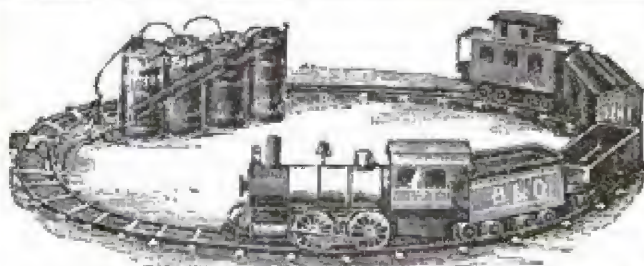
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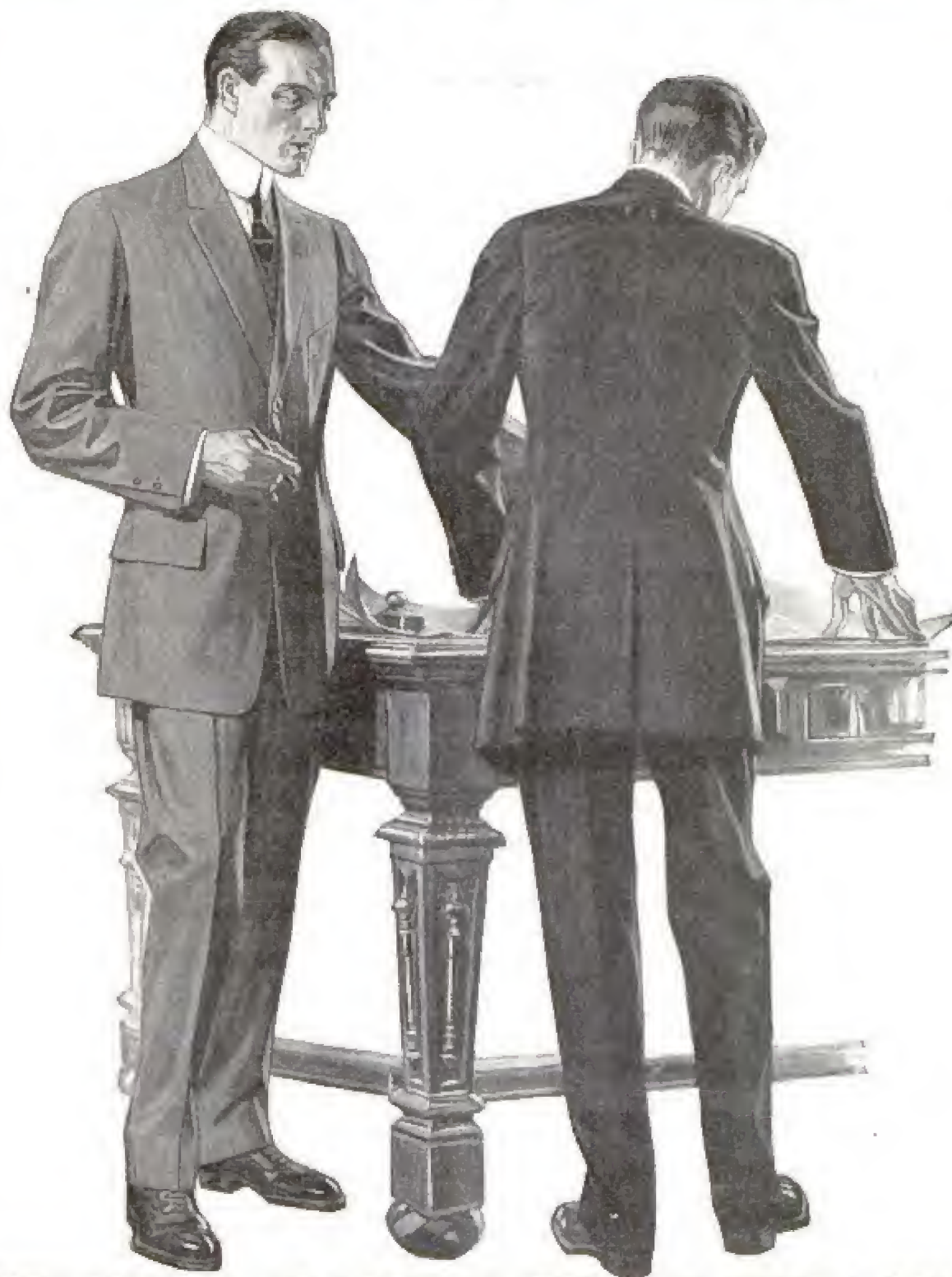
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